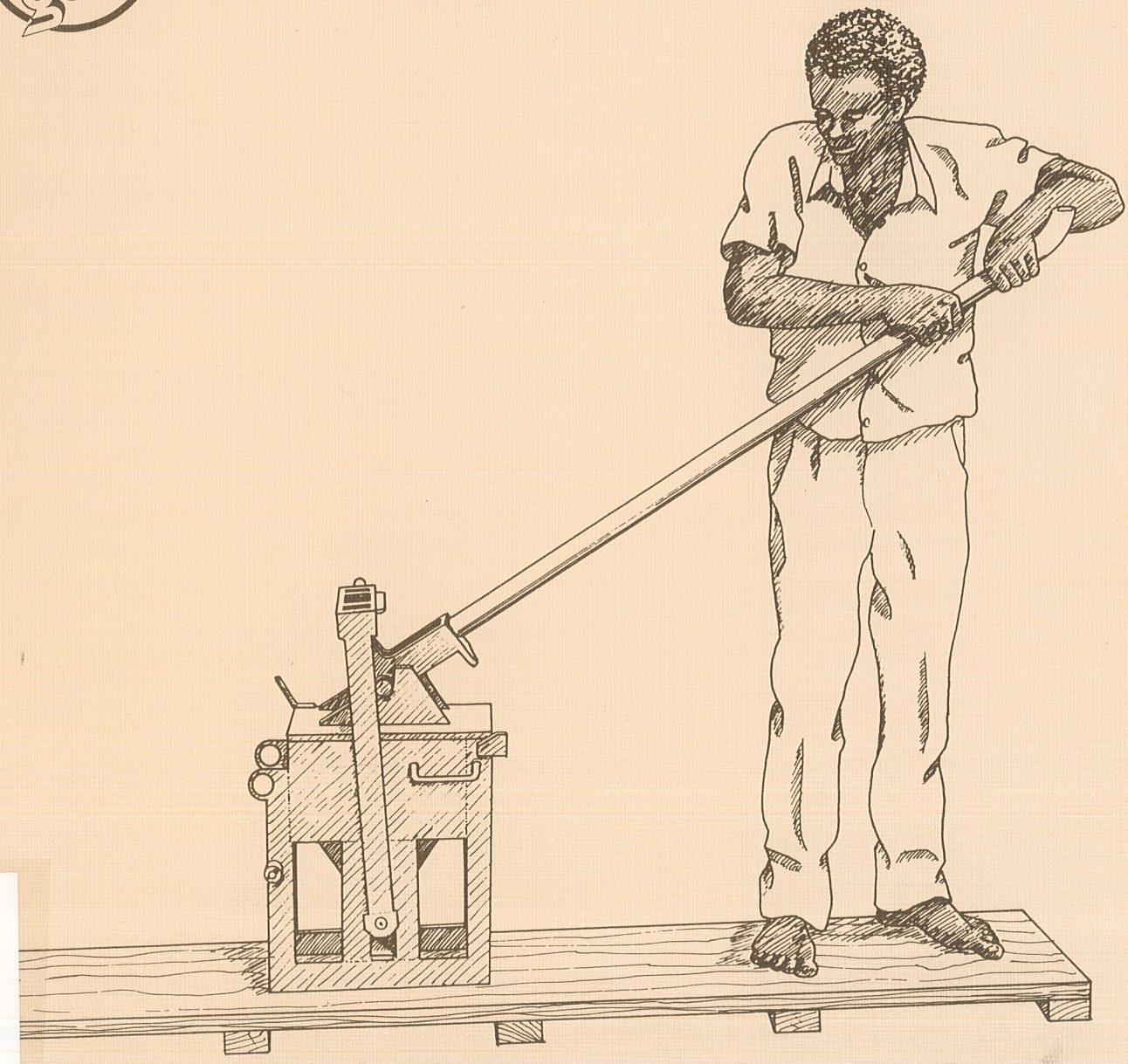
Soil Block Presses

Aus der Arbeit von GATE



PRODUCT INFORMATION

Soil Block Presses

TECHNOLOGY

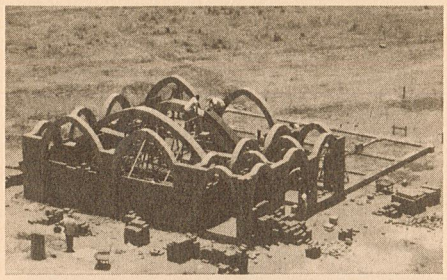
Building with Earth

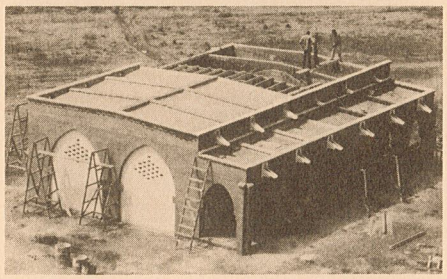
The *advantages* of building with earth are:
- *availability* in large quantities in most regions,
- hence *low cost* for excavation and transportation or no cost, if found on the building site,
- *easy workability*, usually without special equipment,
- suitability both as *wall and roof construction material*,
- *fire resistance*,
- *favourable climatic performance* in most regions, due to the high thermal conductivity and porosity, thus subduing extreme outdoor temperatures and maintaining a satisfactory moisture balance,
- *low energy input* in processing and handling unstabilized soil, requiring only 1 % of the energy needed to manufacture and process the same quantity of cement concrete (soil-cement requires up to 75 %),
- *unlimited reuseability* of unstabilized soil (ie recycling of demolished buildings),
- *environmental appropriateness* (use of an unlimited resource in its natural state, no pollution, negligible energy consumption, no wastage).

In spite of these advantages, earth constructions have not found the wide acceptance they deserve, largely due to the *poor durability* of various traditional and wrongly constructed buildings. The main reasons are:
- *excessive water absorption*, causing
  - cracks and deterioration by frequent wetting and drying (swelling and shrinkage)
  - weakening and disintegration by rain and floods,
- *low resistance to abraison and impact*, thus rapid deterioration through climatic elements and human usage, and penetration by rodents and insects,
- *low tensile strength*, making earth constructions susceptible to destruction during earthquakes.

On account of these limitations, soil constructions still lack institutional acceptability in most countries, which is why building codes and performance standards often do not exist.

Contrary to common belief, building with earth is *not a simple technology*. The mere fact that natives of many countries have been building their houses with earth since thousands of years does not mean that the technology is sufficiently developed and known to everyone. It is indeed the lack of expertise that brings about poor constructions, which in turn gives the material its ill reputation. On the other hand, it must be remembered that some cultures give longevity least importance, eg in the case of nomadic tribes or those who abandon the house when the owner dies.





Procedures

As stated above, the technology of soil construction is a complex one, requiring a deeper knowledge of the material, its limitations, methods of handling and proper design. The number of possible solutions is enormous, so that the problem is mainly one of making the best choice. In the following, the main procedural steps for a satisfactory soil construction are listed with brief comments. These operations are well documented in a number of publications (see Select Bibliography) and the reader is advised to refer to them for details.

Soil Selection
- The variety of naturally occurring soils is immense and not all soils are suitable for all building purposes.
- They can differ in chemical composition and grain size distribution, factors which determine their performance.
- *Soil selection is not only a matter of experience, simple field tests and subsequent laboratory tests are vital.*

Soil Testing
- The list of tests is long and not all are needed for each soil type and use.
- The main field tests are by sight, smell, touch, by making balls, ribbons and threads, by sedimentation in a glass jar and by dropping.
- Laboratory apparatus is needed for particle size analysis by sieving, for determining shrinkage, plasticity, dry strength, compressibility, optimum moisture content and cohesion.

Soil Preparation
- Depending on the type of construction (eg rammed earth, adobe, compressed blocks) the soil mixture must satisfy certain requirements.
- These may call for: addition of sand or clay, crushing, sieving, dry and wet mixing, all these with regular checks to achieve uniform qualities. *An optimum soil mix can compensate for a number of other deficiencies.*

Soil Stabilization
- To improve the qualities of the soil mixture, a large variety of stabilizers can be added. The main ones are:
- *Fibres* (such as straw, agricultural wastes, animal and synthetic fibres) to improve the tensile strength.
- *Cement*, to improve the compressive and tensile strength, dimensional stability, erosion resistance.
- *Lime*, dependent on the clay content of the soil, to achieve a similar improvement as with cement.
- *Bitumen*, mainly to reduce water absorption.
- *Natural and synthetic resins*, for increased load-bearing capacity, elasticity and impermeability.
- *Animal* (cow dung, blood, hair, casein) *and vegetable products* (oils and fats, ashes, sap).
- *Commercial products*, mainly for impermeability.

Soil Compaction
- All soil constructions require some form of compaction, either by throwing, vibrating, ramming or mechanical compression. The method and degree of compaction are directly related to the ultimate strength of the structure.
- *This Product Information Portfolio deals with mechanical compression, which can achieve the highest level of compaction, usually in the form of blocks for masonry structures.* The devices required for this purpose are described in "Equipment".

Drying and Curing
- All soil constructions have to dry for several days to gain strength, the time needed depending mainly on the weather conditions. Hence, controlled drying and protection from rain are essential.
- When cement or lime is used for stabilization, the material must be kept moist for the first 4-5 days (for curing).
- *Depending on the degree of compaction, compressed soil blocks can be stacked (up to 5 layers) immediately or on the next day.* Some block producers claim using the blocks in the building operations, without any drying beforehand. This technique is not widely accepted, as problems of durability are believed to arise.

Design and Construction
- For space limitations, the innumerable criteria for design and construction cannot be mentioned here. But an old saying puts these criteria in a nutshell: "All cob (soil) wants is a good hat and a good pair of shoes", that is, *the base and the roof of a building are of greatest importance.*
- A well designed building with well compacted earth walls can do without external rendering, though in humid climates some surface protection is usually recommended. *Good quality compressed soil-cement blocks generally need no surface protection, thus saving costs, time and energy.* If a render is applied, the choice is very wide, and some experience is needed to select the most appropriate one.

EQUIPMENT

Development of Soil Block Presses

Since the quality and durability of soil constructions was generally compared with that of burnt brick masonry and more recently with concrete block structures, the compressive strengths achieved by manual compaction (by throwing or ramming) were not always satisfactory. In order to achieve higher compaction, mechanical devices were developed, both in the form of tampers, as well as in the form of block presses (first made out of wood, later out of iron or steel). The first documented block press was developed in France in 1789.

The earlier presses functioned mainly as ramming devices for dynamic compaction, eg with heavy covers (30 kg) which close down with great force, displacing the excess soil. Since the beginning of the 20th century press makers have been devising manual and motorized presses that make use of static force. One of the earliest machines, LA MADELON, is still being manufactured in Belgium, although with several modifications and under different names. But most of the older machines have disappeared from the market.

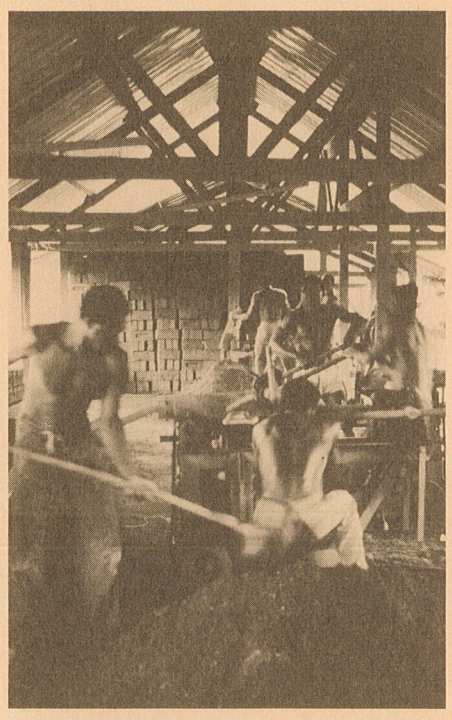
All these machines were relatively large, heavy and expensive, so that their use was limited. What was needed, was a small, light, simple and cheap block press, which could be used on the remotest building sites in the Third World.

According to these requirements, the Chilean engineer, Raúl Ramírez, developed such a machine in 1956. He was then working with CINVA, the Inter-American Housing Center in Bogotá, Colombia. The press was, therefore, called CINVA-Ram, whereby "Ram" was derived either from *Ramírez*, or from the English word for a compacting device.

The CINVA-Ram is now by far the best-known and most widely used block press. Numerous variations of it have been manufactured in many countries, but, in its original form, it still is the lightest and least expensive block press available - every improvement, in terms of handling, output and sturdiness, invariably means an increase in price.

In the 1950s and 60s, interest in soil constructions was generally low. In the 1970s, research work and implementation of soil technologies in development projects steadily increased, largely on account of the world-wide energy crisis. Apart from several other publications, Hassan Fathy's "Architecture for the Poor", which was published in 1973, did a great deal to revive interest in soil construction systems.

In the course of these developments, a new generation of soil block presses came into existence in the 1970s, namely complete production units on wheels. The equipment generally required for blockmaking, apart from the press, are a sieve, a mixer and a measuring scoop for charging the mould, although quite often these are substituted by manual operations and estimation of appropriate soil mix proportions and required quantity of mould filling. The new, partially or fully automatic machines accomplished all these tasks in quickly repeating operation cycles, thus achieving higher outputs of uniform, superior quality bricks.



Soil Block Presses Today

There are basically four types:

Manual presses: the moulding and turning out operations are carried out by the machine which is operated manually.

Motorized presses: the moulding and turning out operations are carried out by the machine which is power driven.

Mobile production units: the production unit is easily transportable and the moulding and turning out operations, the preparation of the raw material and/or the evacuation of the finished product are entirely automated.

Industrial production units: these production units are particularly difficult to transport but the entire process is automated. *These units are not included in the Product Information.*

Corresponding to the great diversity of these machines, the prices range between 500 and 75.000 US$. The following (extremely generalized) compilation of the respective advantages and problems clearly shows that each system caters for a certain range of needs and thus has a valid place to fill. Grossly simplified, the cheaper devices are taken to be manually operated, while the expensive machines are referred to as motor-driven and automated.

Advantages of manually operated presses:
- Low capital and operational costs.
- Quick delivery.
- Low weight (devices like the CINVA-Ram can, if necessary, be taken along as unaccompanied flight luggage; easy to transport on wheelbarrows or bullock-carts).
- Small size, thus little storage space required.
- Simple to use, even for unskilled workers.
- Apart from cleaning the mould and lubrication of moving parts, low maintenance requirements.
- Possibility of repairs in local workshops, no special spare parts required, except for compression rings special hard steel (45 - 50 Rockwell).
- No additional costs of energy.
- No time loss due to failure of energy supply.

Problems of manually operated presses:
- Low rate of production per machine (on average between 40 and 150 blocks per hour), thus requiring a number of machines to achieve a reasonable output.
- Low compaction pressure (averaging 0.5 to 2.5 N/mm²), hence poor soils are likely to produce weaker blocks (ie lower compressive strength, higher moisture absorption, susceptibility to disintegration).
- Tendency to produce irregular block sizes or compaction, depending on compressing system, if filling the mould is done manually.
- Tiring operation; thus, in the course of a series production, tendency of gradual drop in quality and uniformity of blocks produced, if the pressure is continuously exerted by the same person.

Advantages of automatic, motor-driven presses:
- High rate of production (on average between 200 and 1500 blocks per hour).
- High compaction pressure (between 4 and 24 N/mm²), hence good quality of soil blocks (optimum dimensional uniformity, stability of edges and high compressive strength, low moisture absorption, saving of costly and tedious surface treatment).
- Continuously uniform quality of blocks, since no muscle power is applied.
- Requirement of only small proportions of binder (thus saving costs), on account of the high compaction pressure.
- Reduction of manual work, thus saving costs, where wages are high.

Problems of automatic, motor-driven presses:
- High capital and operational costs.
- Relatively long delivery time.
- Usually very heavy, requiring powerful lifting gear and vehicles for transportation, ie transports are troublesome and expensive.
- Large size, requiring large working area, making safe storage under lock and key difficult.
- Requirement of high insurance cover.
- Necessity of skilled labour for operation of machines.
- Maintenance requirements (eg some hydraulic machines) comparable or more complex than for motor vehicles.
- Requirement of specialists for repairs; spare parts possibly expensive and difficult to get, or only after long delivery time.
- Dependancy on local energy supply.

Summary

The above list of advantages and disadvantages of the different categories of soil block presses lead to the following conclusions:

Small, manually operated machines are best suited:
- in case of limited capital resources;
- for projects in remote areas, or those that lack the necessary infrastructure;
- on small building sites, with limited working space;
- in areas of low precipitation, thus excluding the danger of excessive water absorption;
- for small building projects with single-storeyed structures, for which the quality of soil blocks is of less importance;
- in places, where the potential for self-help inputs is high;
- or where entrepreneurs, with a small capital base and a team of unskilled workers, produce soil blocks for the local market.

Powered, high capacity machines are advantageous:
- where sufficient financial resources are available;
- in cases where high production rates are needed and there is a high demand over a long period;
- for projects that specify better qualities of soil blocks;
- in working environments with sufficient energy supply, as well as maintenance and repair facilities;
- in cases, where labour is expensive or not easily available;
- or in case of disaster aid operations, which necessitate efficient and quick help, and good, cheap material in large quantities. (Quite often, tents and other temporary accomodations are provided at high costs, requiring more permanent substitutes later on. It is wiser to help disaster victims to build stable, permanent houses straight away. Thus it could be a far better bargain, to invest the money, which usually is spent on provisional measures, in the procurement of a high capacity soil block press.)

CRITERIA FOR SELECTION AND PURCHASE

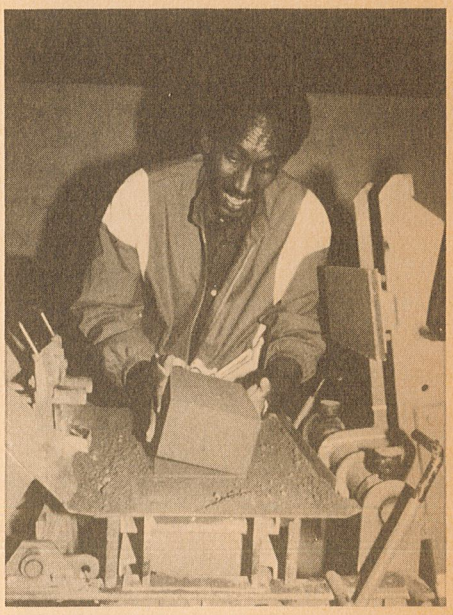
General Considerations

In view of the vast choice of machines available, it seems difficult to decide which one should be bought. If there is not enough money to buy expensive equipment, the choice is smaller and the decision much easier. But generally, the following points need to be considered, especially when the available resources allow for the purchase of higher priced equipment.

Design of Press
- Compressing blocks is only part of the operation, hence apart from the press, *additional equipment* (eg crushing machine, sieve, mixer, measuring scoop) is needed. In the case of machines which incorporate all these functions in a single unit, consideration should not only be given to the costs, but also to the required storage and working space, ease of transport, production efficiency and quality, output rate and the like.
- However, sophisticated mechanical and electronic control devices often necessitate special training and experience for *maintenance and repairs*. Spare parts are usually expensive and difficult to procure (import).
- The *filling of moulds* both manually and automatically is commonly by volume (less frequently, though more accurately by mass). In rotating or drawer moulds, which only pass once under a fixed hooper, the quantity of fill on each side is likely to differ, thus producing non-homogeneous blocks.
- *Moulds* have to withstand high pressures over long periods, hence preference must be given to thick, reinforced mould walls for durability and resistance to deformation. Speed and ease of changing moulds also need consideration, which can be a drawback, the more moulds a rotating table has.
- *Compression and ejection* can be in vertical and/or horizontal direction. Ideally the blocks should be laid in masonry such that the structural forces follow the same direction as the compression force during production. Also the exposed side of the block should preferably be smooth for greater durability.

Energy sources
- Smaller presses are invariably manually operated (muscle power), while larger units are usually motorized (electric motor, diesel, or petrol engine). *Manual presses* depend on the weight, strength, stamina and motivation of the operator, while *mechanized presses* overcome the problems of human fatigue and non-uniform products.
- *Energy transmission* to the block can be via a lever, toggle, cam, pivot, ball and socket joint, piston, etc. But principally there are two systems of energy transmission: mechanical and hydraulic.
- *Mechanical systems* are usually simple but relatively heavy, unless special alloys are used, in which case repairs may be difficult.
- *Hydraulic systems* are susceptible to dust, sand and heat, under harsh conditions the hydraulic fluid must be changed once a month, so that maintenance can be difficult and costly. The systems are usually designed for operating temperatures around 70° C, but under tropical conditions temperatures can reach 120° C, requiring cooling mechanisms and/or special spare parts and oils to withstand the heat. Flexible tubing, joints, etc. that need frequent replacement should best be standardized.

Compression of Blocks
- There is a difference between the *real pressure* acting on the brick and the *theoretical pressure*, which neglects losses due to friction and inertia. The difference can be about 50 % of the theoretical value. The required standards generally specify the real pressure at the end of the cycle, hence manufacturers should be asked to explain their measurement procedures in order to check their validity.
- The *compression ratio*, which is the difference between the depth of the mould (with uncompacted earth) to the height of the compressed block, should not be less than 1.65, preferably around 2, which is rarely achieved by mechanical compaction. Hence, pre-compression (eg by forceful closing of fold-back lid) can be advantageous. Machines in which the compression ratio can be adjusted according to the soil type, can be especially useful.
- The *speed of the compression process* is of significance for the rate of production, but it must be noted that compression cycles below 2 seconds for 10 cm thick blocks run the risk of lamination. If the compression process is too rapid, the cycle should be interrupted after pre-compression to allow the compressed air to escape, after which the cycle is completed at a slower pace.



Material Quality
- The quality of the block improves proportionately with the *increase of moulding pressure*. However, this is true only up to a critical point, which lies between 4 and 10 N/mm² (depending on the soil type), after which lamination can occur, especially when applied too rapidly.
- *Double-sided compaction* from above and below produces more homogeneous and durable blocks, than one-sided compression.
- Even though the compressive strength of blocks, in most cases, need not be high - the quality of the CINVA-Ram type blocks is structurally quite adequate - it is important to note that *insufficiently compacted blocks* are porous and easily absorb moisture, the coarse surface is difficult to keep clean and can be abraded easily, while cracks and cavities are likely to harbour vermin. Such surfaces usually need some protective coating, which naturally incurs additional costs. Denser blocks, which have been compacted with pressures upwards of about 3 to 4 N/mm², can remain untreated, offer no refuge to insects, and can do with only small quantities of binder (ie cement or lime).
- Alternatively, in case of low compaction pressures, a *chemical additive* (eg asphalt-based) can provide the necessary moisture resistance. However, such additives do not increase the compressive strength of the block, and it should also be remembered that these substances invariably have to be imported, thus making the production of blocks more expensive and dependent on supplies.

Block Dimensions

• Small sizes require a greater number of blocks per cubic metre than larger ones, so the overall effort needed to produce small blocks is greater than that of making larger ones. Furthermore, masonry constructions with small bricks require more mortar, since the proportion of joints is higher. Therefore, the *best block format* is determined by the maximum weight and size that can be easily handled by a single person using only one hand. The most common dimensions are 29.5 x 14 x 9 cm (l x b x h).

• When pressure is applied only on one side, the *height of the block* is limited to 10 cm, above which the opposite side remains weakly compacted.

• It is useful to be able to produce *hollow blocks* of all kinds, partially or totally hollowed out from one side to the other. The total volume hollowed is generally limited to about 30 % for the most efficient processes. Frogs (removeable mould inserts) up to 5 % are usual.

• Certain presses can produce a complete *range of products* (large and small blocks, paving and roofing tiles, etc.) which is a distinct advantage, but which has its price.

Productivity

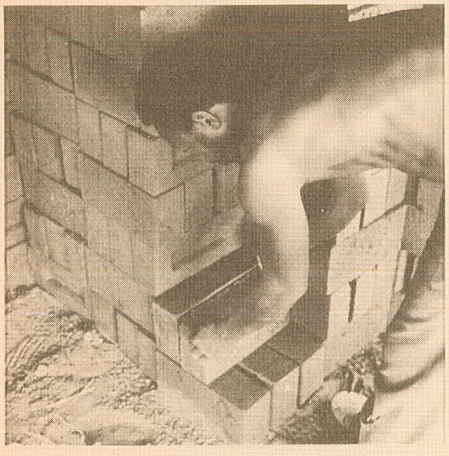
• Under *theoretical conditions*, given a 15 second cycle, for example, 2000 production cycles can be run in an eight hour working day. If one increases the complexity of the compression action (double compression, compression in two steps, dynamic compaction) the cycle is longer; in this event, the constructors provide for the production of several blocks per cycle.

• The machine's output is often indicated according to the theoretical production cycle. The *real productivity* in the field is different and depends upon a number of factors that are totally independent of the machine's theoretical capacity, eg breakdown time, manpower organization, maintenance, etc. Real productivity lies quite often around or under 50 % of the theoretical production cycle.

• The theoretical production cycles of the most efficient *manual presses* lie between 30 and 60 seconds.

• As concerns the *motorized presses* calling for human intervention, it is difficult to run a complete cycle in less than 15 seconds - filling, compression (1 to 2 seconds) and turning out included.

• *Automatic production units* can, in the best of cases, complete this same cycle in 4 or 5 seconds.



Manual Work

• The *normal work force* comprises about 5 people excavating, sieving and mixing the soil, as well as curing and stacking the previous day's production, and at least 3 people to fill the mould, operate the press and remove the block to the curing area.

• Considering that a manually operated press requires the person, who pulls or pushes down the lever, to exert a great force, up to about twice every minute, it becomes clear that gradual exhaustion causes diminishing performance and lower quality blocks. In view of this, every means of *facilitating manual operations* should be given priority, if the financial resources permit. If a motor-driven machine is chosen, it would be advantageous to also be able to operate it manually, in case of short supply of energy, or failure of the motor.

• Special attention should be given to *safety measures*, such as avoidance of projecting moving parts, designing manual operations such that hands cannot get jammed between moving parts, clearly marking and/or protecting dangerous points, incorporating thermal fuses, security pins, etc. Automatic machines must *at all cost* be equipped with an *emergency stop switch*, which is easily accessible.

Manufacturer

• The advantages of *large machine producing companies* are generally:
- a strong capital base,
- large, efficient working team with modern equipment,
- high sales figures and good (international) references,
- good administrative backing,

but the machines are likely to to be more expensive than those of smaller firms.

• In *small machine producing firms*, the manager is usually part of the workshop team. The advantages are generally:
- high motivation,
- low overhead and production costs, thus lower price of machine,
- frequent modification and improvement of machine.

Small firms or their machines are often not so well-known, because of small advertising budgets, hence their list of references can be small in spite of a good product.

• *Personal visits* to the manufacturer and/or sites at which the machine is in use should be undertaken as far as possible. The value of *reference lists* is to be able to meet or correspond with users, to learn about their experiences. If reference lists do not contain addresses, these should be specifically asked for.

• Of special advantage are *training courses*, offered by some manufacturers. To be effective, they should not only include the production of blocks, and handling and maintenance of the machine, but also the testing and use of problem soils, as well as design guidelines for building construction. Trainees should also learn to dismantle and assemble the machines, to understand their function and conduct repairs by themselves.

Purchase of Machine

• The *"FOB" price* (free on board) includes packaging, transportation and insurance costs of the machine within the retailer's country. This price can be artificially inflated in order to compensate for the reduction offered on the factory price.

• As regards *sales or rental conditions*, one must be suspicious of contracts providing for price indexing based on the number of blocks produced or for payment of royalties for patent use, which is often not justified. A patent is not necessarily a proof of guaranteed quality and constructors frequently apply for patents for processes that are already of the public domain.

• It is advisable to include a *penalty clause* in the contract, to safeguard against late delivery.

• In the case of an *after sales service contract*, the waiting period for repairs and maintenance must be clearly indicated. A detailed handbook should be provided, including specifications of all spare parts and a maintenance plan, indicating operations necessary and expected maintenance frequency.

Checklist for Potential Buyers

The following is a summary of the main points to be considered when selecting the most suitable block press:

• *Available financial resources* (budget restraints can limit the choice considerably).

• *Required quality of blocks* (small low-cost houses do not need highly compacted blocks, harsh climates may need stronger blocks).

• *Required production rate* (the choice can be several less efficient presses, or a few high-output machines).

• *Weight and mobility of machine* (the presses may have to be moved frequently from site to site).

• *Available energy sources* (not only the costs must be considered, but also the frequency of power failures and supply shortages of diesel, petrol, etc.).

• *Availability of spares and skilled technicians for maintenance and repairs* (machines with standardized parts create less problems).

• *Versatility of machine* (presses with interchangeable moulds for a variety of products can bring about considerable savings).

• *Operational safety* (for this, several demonstrations of use, especially with unskilled workers, should be seen).

• *References* (contacts with users of the machine should be made whenever possible).

• *Conditions of purchase* (since machines with similar outputs are available, *comparisons* of prices, discounts for large orders, delivery time, etc. *are urgently recommended*).

• *After sales services* (not only should the manufacturers be fair enough to rectify defects of their machines by providing technical assistance or supplying spare parts at minimum or no-cost; users should also take the trouble to send accounts of their experiences and suggestions for improvements to the manufacturers, for without this *feedback*, no effective development is possible).

Final Advice

The quality of the soil used is more important than the quality of the press. In other words, *a good soil in a poor press can give better results than a poor soil in a good press.*

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Latin America **1**

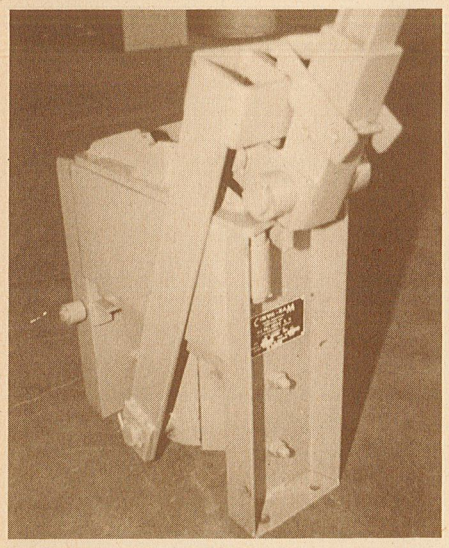
CINVA - Ram

Manufacturer
METALIBEC S.A.
Apartado 11 798
Carrera 68B no. 18-30
Bogotá, D.E.
Colombia
Tel. 261 32 77, 261 13 15
Tlx. 43 247

Description

The CINVA-Ram, which was designed by Raúl Ramírez at the Inter-American Housing Center (CINVA) in 1956, is the oldest, truly low-cost, portable soil block press, and numerous manual presses produced in different parts of the world are based on the design and working principle of this machine.

The press, made entirely of steel, basically consists of a mould box with a cover, onto which a toggle lever is rolled. This is connected via a yoke to a piston below the mould box, which has a moveable base plate fixed to the piston. When the lever is pressed down, the piston moves upwards between two adjustable angles. The whole unit is mounted on a heavy wooden base board (about 300 x 20 x 5 cm) to provide stability during operation.



For the production of bricks and tiles, which have the same dimensions as the blocks but less thickness, inserts are provided to reduce the height. These are usually wooden blocks with a metal face and can have various shapes (so-called "frogs") to produce bricks with recesses, grooves, cavities, etc. for special uses.

The CINVA-Ram is also distributed by:
Schrader-Bellows Inc.
200 W Exchange Street
Akron, Ohio 44309, U.S.A.

Operating the CINVA-Ram

In the vertical position, the lever arm is fixed to the yoke by means of a latch. These are pulled back together and the mould cover swung open. After greasing the sides of the mould, the soil mix is filled in, making sure that the corners are properly filled and slightly compressed by hand. When swinging back the mould cover, the surplus soil is removed.

The lever is brought back to the vertical position and the latch released. The lever arm is then pulled down on the side opposite to its previous position, to compress the block. When the block is fully compacted, the lever arm is swung back over the mould to its position during filling.

The mould cover is opened and the lever arm depressed further until the block is completely ejected and held in this position until it is removed from the press and placed on edge at the curing site.

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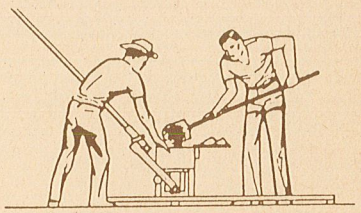

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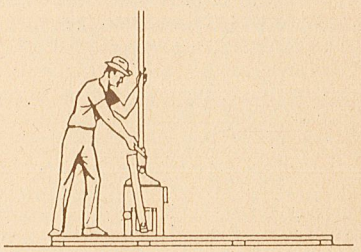

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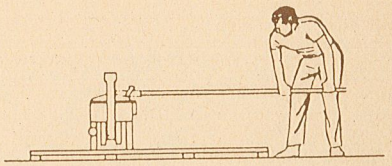

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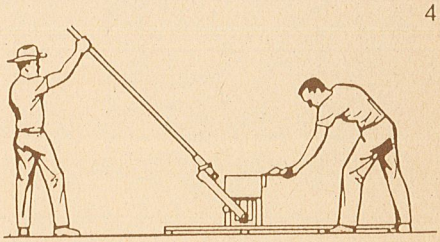

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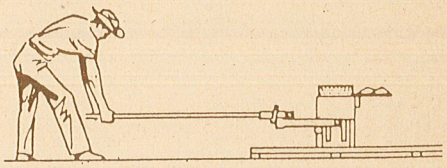

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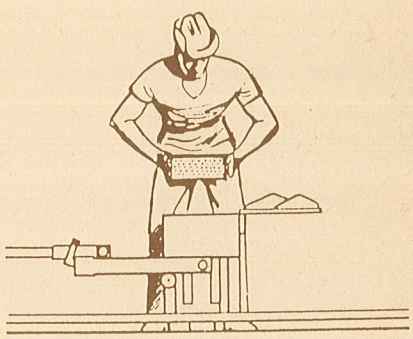


Technical Details

Size of machine (length x width x height)		41 x 25 x 51 cm (16 x 10 x 20 in)
Weight of machine		58 kg
Size of crate for shipment		29 x 70 x 49 cm (12 x 28 x 19 in)
Weight of packed machine		67 kg
Standard block size (single mould)	a.	29 x 14 x 9 cm (11.5 x 5.5 x 3.5 in)
	b.	29 x 14 x 3.8 cm (11.5 x 5.5 x 1.5 in)
Maximum nominal compaction force		18 tonnes
Nominal compaction pressure		4.4 N/mm² (630 p.s.i.)
Compression ratio		1.7 : 1
Energy input/transmission		manual/mechanical
No. of blocks per cycle/output rate	a.	1 / 37 blocks per hour
	b.	1 / 60 blocks per hour
Labour force required (incl. excavation and mixing)		4 men

Price (ex works) valid January 1988
Col.$ = Colombian Dollars

CINVA-Ram ..... 35500 Col.$ ..... (approx. 230 US$)
(Discount of 30 US$ per unit for purchases of 10 units or more.
Shipping cost for export are at buyer's expense.
Spare parts, replacements and technical advice available on request.)

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Latin America **4**

CRATerre AMERICA LATINA Press

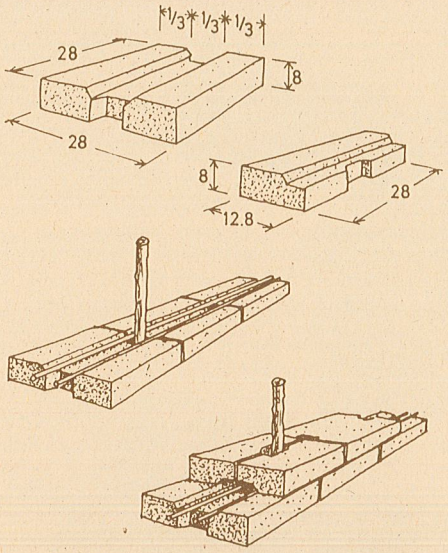
Manufacturer
CRATerre AMERICA LATINA
Apartado Postal 5603
Correo Central
Lima 1
Peru
Tel. 14 40 60 27
Tlx. 25 201 pe pb hboli

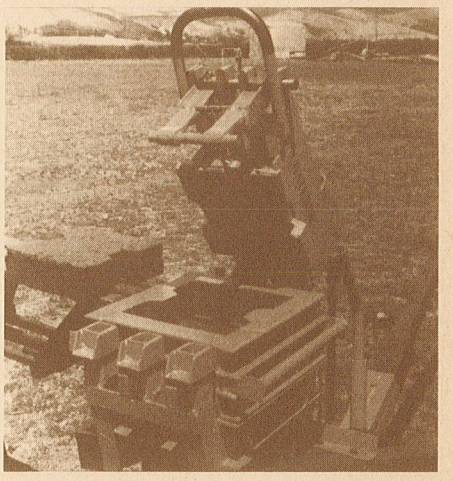
Description

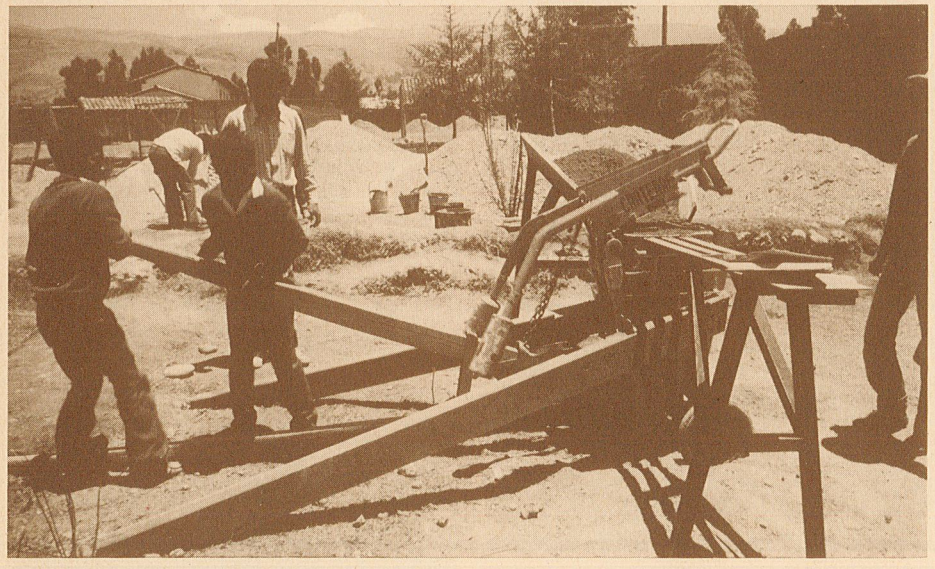
The CRATerre AMERICA LATINA press was developed in 1982 by Silvia Matuk, François Vitoux and Alain Hays of the non-profit Peruvian organization so named. It was produced only for use in the organization's own projects, and is not yet available for sale.

The machine was especially designed to produce large-sized earth blocks, similar to the traditional adobe blocks, but which are more uniform and specially shaped for earthquake resistant construction (by providing horizontal and vertical grooves and cavities, into which steel and wood reinforcements are placed).

Two wheels are provided to facilitate movement of the machine around the site, and special tables are placed on either side of the mould, one to provide a continuous supply of earth and the other to place the finished blocks on before they are removed for drying.







Operating the CRATerre A.L. Press

Four people are needed to operate the machine, while two to three more are required for excavation and preparation of the earth, which is continuously loaded onto the sloped table, ready for moulding.

A worker standing in front of the press scrapes the soil from the table into the mould. The lid, which is held open by means of counter-weights at the back, is pulled down forcefully to pre-compact the soil. Two workers are necessary to push down the lever arm to compress the soil sufficiently, after which the lid is unclamped and allowed to open. By pushing the lever arm further down, the block is ejected and placed aside by the worker in front of the press. While another worker takes away the block for drying, the mould is filled again without delay, to repeat the production cycle in quick succession.

Technical Details

Size of machine (length x width x height)		230 x 280 x 124 cm (90 x 110 x 49 in)
Weight of machine		280 kg
Size and weight of packed machine		not applicable
Standard block size (double mould), each	a.	28 x 12.8 x 8 cm (11 x 5 x 3.2 in)
Standard block size (single mould)	b.	28 x 28 x 8 cm (11 x 11 x 3.2 in)
Maximum nominal compaction force		16 tonnes
Nominal compaction pressure		2 N/mm² (290 p.s.i.)
Compression ratio		1.67 : 1
Energy input/transmission		manual/mechanical
No. of blocks per cycle/output rate	a.	2 / 240 blocks per hour
No. of blocks per cycle/output rate	b.	1 / 120 blocks per hour
Labour force required (incl. excavation and mixing)		5 - 7 men
Price		Machine not for sale; produced only for use in projects of CRATerre A.L.

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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Tel. (06196) 79-0
Tlx. 407 501-0 gtz-d

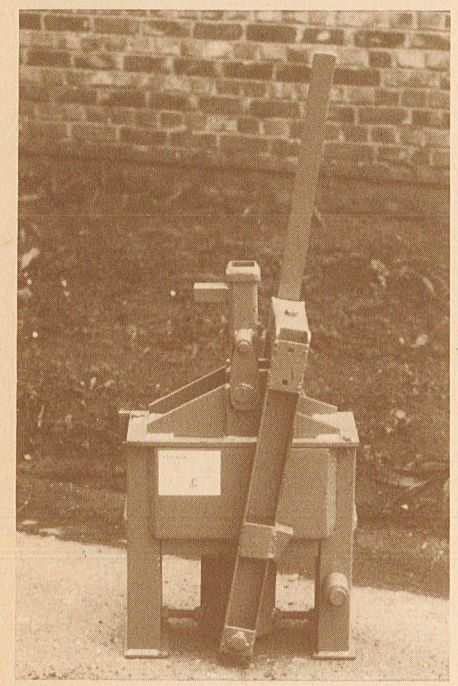
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Europe **1**

UNATA 1003 and 1004

Manufacturer
UNATA C.V.
G.V.D. Heuvelstraat 131
B-3140 Ramsel-Herselt
Belgium
Tel. 16 56 10 22
Fax. 16 56 20 25
Tlx. 21 874 ppr b

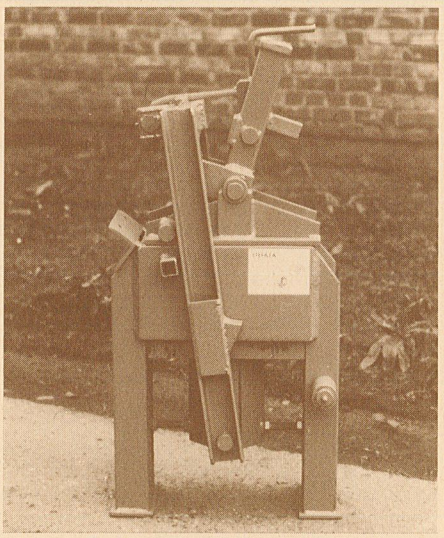


Description

The UNATA 1003 and 1004 are modified versions of the CINVA-Ram, produced by UNATA (Union for Appropriated Technological Assistance), a small cooperative, established in 1979 and dedicated to the development of simple machines and dissemination of know-how for application in developing countries. The original UNATA Block Press was 1000, hence every increase in the model number indicates a modification or improvement of the previous model, based on research and evaluation of experiences in the field.

The UNATA 1003 is made of higher quality material for the axles and sleeves, increasing its durability to 3 times that of the UNATA 1002. The latch that previously had to be locked and unlocked during each production cycle, has been replaced by a lever that just has to be pushed back and forth for compression and ejection of the block.

The UNATA 1004 is made of the same materials as the UNATA 1003, but the lever operations for compression and ejection are only on one side of the machine. The mould cover is held by a latch and pulled off the top with the lever arm, providing unobstructed access to the mould during filling and removal of the block. The height of the mould was also increased to reduce the physical strain on the workers. By these modifications, a much higher output rate is achieved.



Operating the UNATA 1003

The operation sequence is the same as with the CINVA-Ram, except that the lever arm and yoke are not locked together with a latch. When the lever arm is pulled back to the position for filling the mould or ejecting the block, it pulls the yoke with it. A lever at the side of the yoke is used to return the yoke on top of the mould cover, ready for the compression phase.

Operating the UNATA 1004

This machine has the mould cover attached to the lever arm, so that pulling back the lever and opening the mould constitute a single operation. For this, the yoke is fixed to the lever arm with a latch, which is released after the mould is covered, so that the lever arm can be pushed down to compress the block.

Technical Details

Size of UNATA 1003 (length x width x height)	44 x 26 x 71 cm (18 x 11 x 28 in)
Size of UNATA 1004 (length x width x height)	42 x 24 x 89 cm (17 x 10 x 35 in)
Weight of UNATA 1003 / 1004	78 / 86 kg
Size of crate for shipment of UNATA 1003 or 1004	95 x 49 x 31 cm (38 x 20 x 13 in)
Weight of packed machine: 1003 / 1004	100 / 108 kg
Standard block size (single mould)	29 x 14 x 9 cm (11.4 x 5.5 x 3.5 in)
Maximum nominal compaction force	10 tonnes
Nominal compaction pressure	2.4 N/mm² (348 p.s.i.)
Compression ratio: 1003 / 1004	1.7 : 1 / 1.8 : 1
Energy input/transmission	manual/mechanical
No. of blocks per cycle/output rate: 1003	1 / 70 blocks per hour
No. of blocks per cycle/output rate: 1004	1 / 100 blocks per hour
Labour force required (incl. excavation and mixing)	5 men

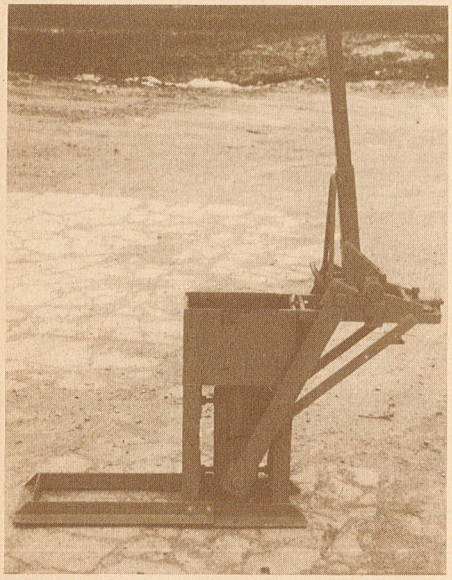
Price (ex works) valid January 1988 FB = Belgian Francs			
	UNATA 1003	18000 FB	(approx. 500 US$)
	UNATA 1004	20000 FB	(approx. 550 US$)
	Tools	900 FB	(approx. 25 US$)
	Sieve	600 FB	(approx. 17 US$)
	Packing	2000 FB	(approx. 55 US$)

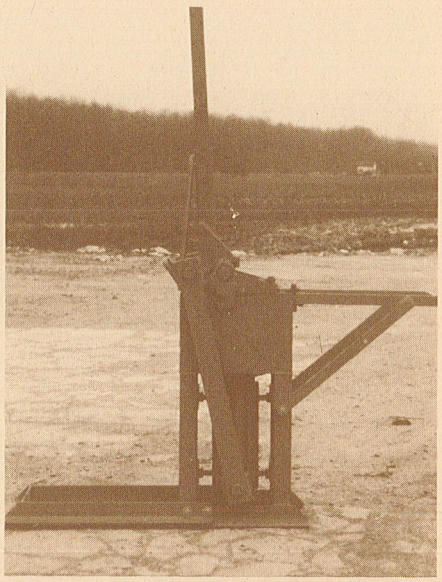
PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Europe 4

DSM

Manufacturer
La Mécanique Régionale
23, rue de la Gare
F-51140 Muizon
France
Tel. 26 02 95 75
Tlx. 306 022 lmr f





Description

The DSM was developed by De Silvestri, and the patent aquired by C.T.B.I. (Construction Terre Bois International), Muizon, a French firm that used to specialize in earth and wood construction. Based on the CINVA-Ram, the machine is a robust, portable, single-mould press, with a cover that slides sideways and a lever arm, which is operated only on one side of the machine.

A relatively high degree of compaction is achieved by double compression acting simultaneously from the base plate and the cover. A steel angle base frame extension is provided and can be loaded with heavy stones or mounted on a heavy timber base board, to keep the machine in a stable position.

All rigid connections are welded and screw connections are provided for those parts that need to be dismantled for transportation.

Operating the DSM

The machine is operated by two people, with one worker occupied with filling the moulds and removing the ejected bricks and the other person handling the lever arm and cleaning the mould from time to time.

With the lever in vertical position, the cover plate is slid aside to open the mould, which is filled by means of a shovel or bucket. The cover is closed again and the lever pulled down for compression. Again in vertical position, the cover is slid aside and the lever arm pressed downwards to eject the brick.

Technical Details

Size of machine (length x width x height)	115 x 28 x 102 cm (46 x 11 x 41 in)
With lever arm extension: total height	225 cm (89 in)
Weight of machine (including lever arm)	85 kg
Size of crate for shipment	55 x 35 x 95 cm (22 x 14 x 38 in)
Weight of packed machine	110 kg
Standard block size (single mould)	29 x 14.5 x 10.5 cm (11.4 x 5.7 x 4.1 in)
Maximum nominal compaction force	12 tonnes
Nominal compaction pressure	2.8 N/mm² (405 p.s.i.)
Compression ratio	1.57 : 1
Energy input/transmission	manual/mechanical
No. of blocks per cycle/output rate	1 / 90 - 110 blocks per hour
Labour force required (incl. excavation and mixing)	5 - 7 men

Price (ex works) valid June 1988
FF = French Francs

DSM	5000 FF	(approx. 860 US$)
Packing	300 FF	(approx. 52 US$)

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in India 1

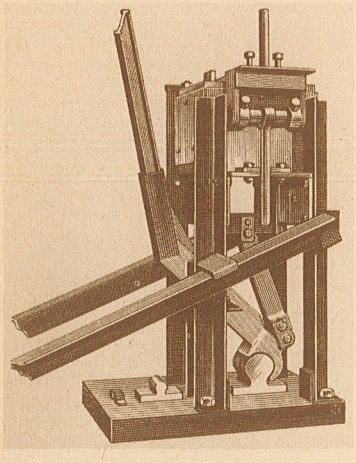
ELLSON Blockmaster

Manufacturer
Kathiawar Metal & Tin Works Pvt. Ltd.
9, Lati Plot (Sadgurunagar)
P.O. Box 202
Rajkot 360 003 / India
Tel. 22 693
Cable KAMETIN

Description

The ELLSON Blockmaster, which is being manufactured in India since 1959, is one of the oldest soil block presses that is still being produced. The press is a robust all-steel welded construction, and is capable of taking on interchangeable moulds to produce blocks, bricks and tiles of different sizes.

The Blockmaster has a lever-linkage toggle mechanism and high compaction is achieved by its high lever ratio, the forceful closing of the lid and "jumping-pull" of the lever.



An important feature of the machine is the height of the mould off the ground, which helps to reduce back-ache from bending down to remove the ejected blocks. The operation of the lever only on one side of the machine is a further advantage.

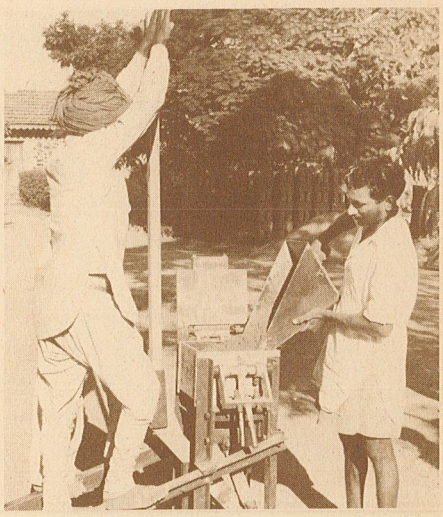
Training courses on soil block production can be arranged by the manufacturer at the works in Rajkot.

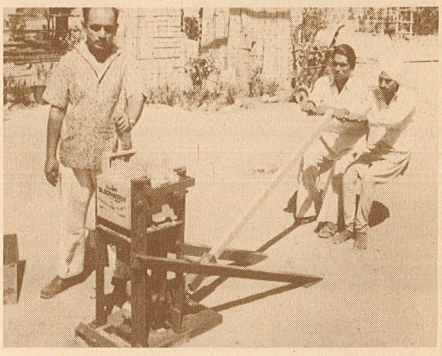
Operating the ELLSON Blockmaster

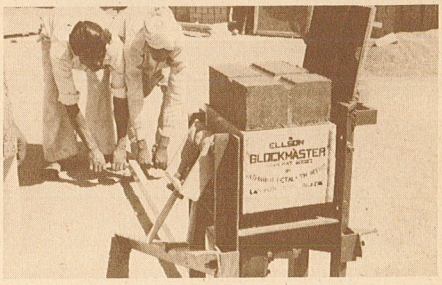
A triangular scoop is provided for each corresponding mould size, to ensure that the mould is always filled with the same quantity of soil. When the mould is filled, the lid is slammed down and held in place with a clamp.

The two operators on the lever now swing back to complete the compression stroke or "pull-down". This should require some effort to obtain a well compacted block. If the lever offers no resistance, the mould is not sufficiently filled, if the required effort is too great for the two operators, the mould is overfilled, in which case it must be refilled with a fresh soil mix.

Once the pull-down is completed, the clamp is released and the lid opened. By further pressing down of the lever, the block is ejected clear off the top of the mould, so that it can be picked off and carried to the curing place.







Technical Details

Size of machine (length x width x height)		66 x 43 x 92 cm (26 x 17 x 36 in)
Weight of machine (without mould)		165 kg
Weight of standard sized mould		43 kg
Weight of largest/smallest mould		57/25 kg
Size of crates for shipment	I. (Blockmaster, moulds)	81 x 64 x 128 cm (32 x 25 x 50 in)
	II. (lever, inclined legs)	182 x 61 x 18 cm (72 x 24 x 7 in)
Weight of packed machine	I.	330 kg
	II.	75 kg
Standard block size (single mould)	a.	29 x 14 x 9 cm (11.5 x 5.5 x 3.5 in)
Other block sizes (single mould)	b.	29 x 19 x 9 cm (11.5 x 7.5 x 3.5 in)
	c.	30.5 x 14.6 x 10 cm (12 x 5.8 x 4 in)
Tiles: same as blocks, but height 5 cm (2 in)	d.	30.5 x 22.8 x 10 cm (12 x 9 x 4 in)
	e.	22.8 x 10.8 x 7.6 cm (9 x 4.3 x 3 in)
Maximum nominal compaction force (two men pulling down lever)		28 tonnes
Nominal compaction pressure		6 N/mm² (853 p.s.i.)
Compression ratio (including dynamic compaction by closing the cover)		1.7 : 1
Energy input/transmission		manual/mechanical
No. of blocks per cycle/output rate	a.	1 / 90 blocks per hour
	b.	1 / 80 blocks per hour
	c.	1 / 90 blocks per hour
	d.	1 / 70 blocks per hour
	e.	1 / 100 blocks per hour
Labour force required (incl. excavation and mixing)		8 - 12 men

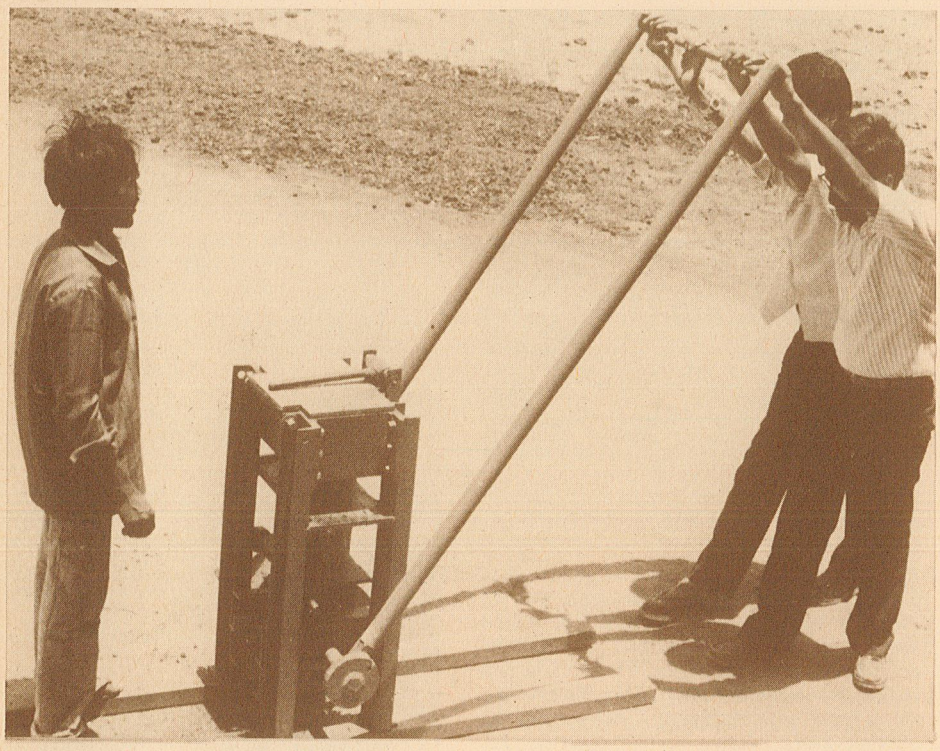
Price (ex works) valid February 1988 Ind.Rs. = Indian Rupees	Blockmaster (with 1 mould)	9800 Ind.Rs.	(approx. 750 US$)
	Blockmaster (with 2 moulds)	11875 Ind.Rs.	(approx. 900 US$)

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in India 4

IIT Madras Cam Block Press

Manufacturer
Building Technology Laboratory
Civil Engineering Department
Indian Institute of Technology
Madras 600 036 / India
Tel. 42 53 42 - 260



Description

The IIT Madras Cam Block Press is the first manually operated machine to employ a cam mechanism (instead of a toggle lever) to push a plunger plate and central piston upwards to compress loose soil into blocks. The press was developed in 1986 by Professor T.P. Ganesan and R. Chandra Sekhar (M.Sc. Thesis), as part of an Indo-German project on "Appropriate Technology for Rural Housing".

The aim was to make the manual operations as simple and fluent as possible, and allow for variations in the compression ratio. The all steel machine, with interchangeable moulds for different block sizes, is assembled with bolts and nuts, so that it can be dismantled for transportation.

Alternative models of the Cam Block Press are under development to increase the efficiency, for instance, by providing a ratchet to the lever, so that the compression and ejection operations can both be done from the same side of the machine.

Technical Details

Size of machine (length x width x height)	200 x 45 x 90 cm (79 x 18 x 36 in)
Weight of machine (without mould)	142 kg
Weight of standard sized block mould	16 kg
Size of crate for shipment	150 x 60 x 60 cm (59 x 24 x 24 in)
Weight of packed machine	200 kg
Standard block size (single mould)	30 x 20 x 10 cm (12 x 8 x 4 in)
Maximum nominal compaction force	15 tonnes
Nominal compaction pressure	2.5 N/mm² (365 p.s.i.)
Compression ratio (can be varied)	1.5 : 1
Energy input/transmission	manual/mechanical
No. of blocks per cycle/output rate	1 / 54 blocks per hour
Labour force required (incl. excavation and mixing)	5 men

Price (ex works) IIT Madras Cam Block Press ...5000 Ind.Rs. ...(approx. 400 US$)
valid June 1988
Ind.Rs. = Indian Rupees

Operating the Cam Block Press

The base plate of the mould box is lowered by moving the lever down on the side opposite to the open lid. The mould walls are greased and the soil filled in with a measuring scoop. The lid is closed and locked by a simple turn of the eccentric roller type arrangement.

Two workers then lift up the lever until it reaches an indicator on the side of the machine. This completes the compression phase. With the lever held in this position, the lid is unlocked and opened.

The lever is then pushed further over the top of the mould to the other side, until it is automatically blocked by the catch of the cam. By this time the compressed block is completely ejected from the mould and can be removed for curing.

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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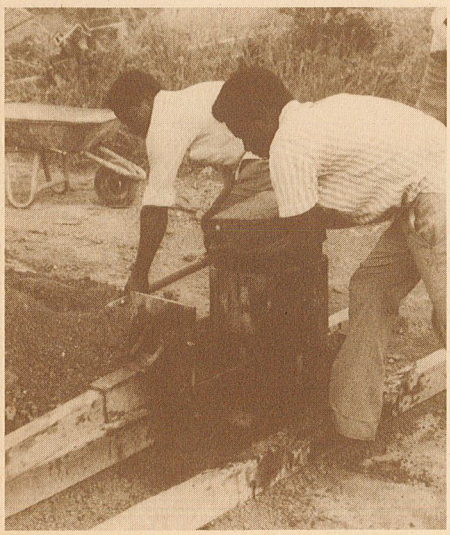
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Africa **1**

TEK - Block Press

Manufacturer
Mechanical Engineering Dept.
Faculty of Engineering
University of Science and Technology
Kumasi
Ghana
Tel. 43 61, 53 51
Cables: Housing Kumasitech



Description

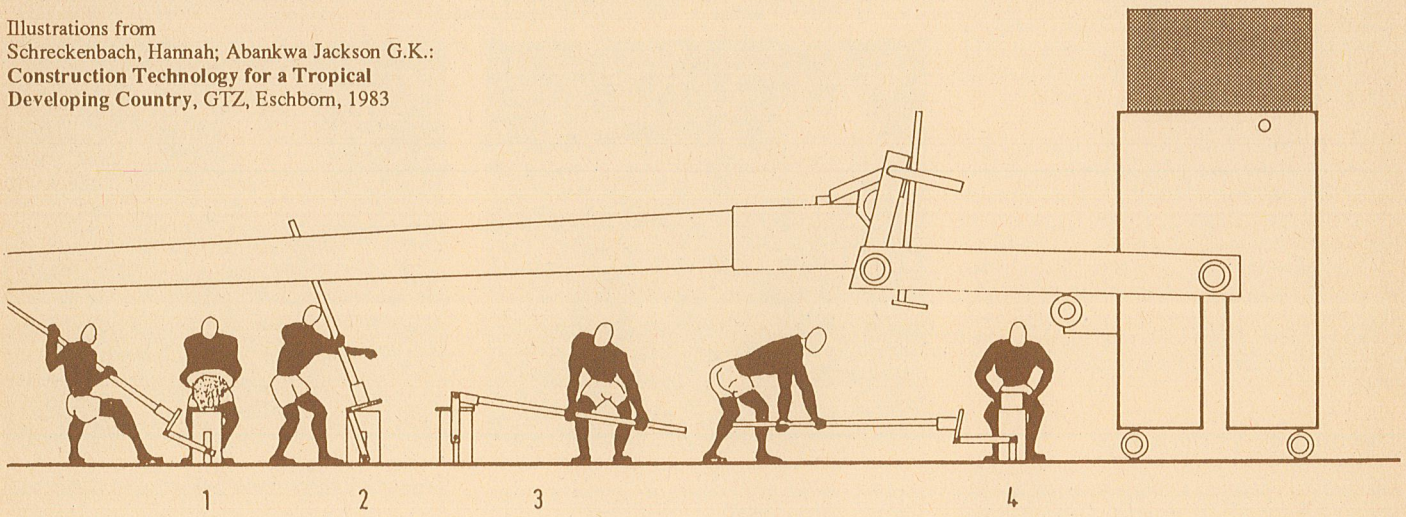
The TEK-Block Press was developed in 1970 by the Department of Housing and Planning Research, Faculty of Architecture, U.S.T. Kumasi, with the aim of modifying the CINVA-Ram to suit the local requirements. While the main components of the TEK-Block Press, with its mould box, moveable cover, lever and piston, are principally the same as those of the CINVA-Ram, some of the details are different.

One important difference is that the lever is connected to the mould cover, which moves back with the lever arm and connecting links, when opening the mould and ejecting the block. This reduces the number of manual operations and provides unobstructed access to the mould.

An automatic locking device is fitted to the connecting link and the handle socket. This locks the handle to the side links, so that they move as a unit when ejecting the pressed blocks. The blocks are demoulded by pivoting the locked assembly on the rear pulleys. This device eliminates the need to manipulate a locking device during the blockmaking cycle.

Instead of the three-piece metal arm used for the CINVA-Ram, the lever arm is a wooden handle inserted in the metal socket. In order to save the costs and effort of transportation, the handle and wooden rails, onto which the machine has to be mounted for stability, are not supplied with the machine, as these are usually available locally. Another reason for using a wooden handle is that it will break before jamming the piston, in case of overfilling the mould.

Illustrations from
Schreckenbach, Hannah; Abankwa Jackson G.K.:
Construction Technology for a Tropical Developing Country, GTZ, Eschborn, 1983



Technical Details

Size of machine (length x width x height)	32 x 23 x 79 cm (13 x 9 x 31 in)
Weight of machine	85 kg
Size of crate for shipment	58 x 50 x 90 cm (23 x 20 x 36 in)
Weight of packed machine	approx. 110 kg
Standard block size (single mould)	29 x 21.5 x 14 cm (11.4 x 8.5 x 5.5 in)
Nominal compaction force	6 - 12 tonnes
Nominal compaction pressure	1.05 - 2.1 N/mm² (150 - 300 p.s.i.)
Compression ratio	1.6 : 1
Energy input/transmission	manual/mechanical
No. of blocks per cycle/output rate	1 / 50 blocks per hour
Labour force required (incl. excavation and mixing)	10 men

Price (ex works) valid January 1988: TEK-Block Press ..... 30000 ₵ ..... (approx. 173 US$)

(Note: The machine has so far not been produced for export. The price serves only as a guideline, as the exchange rate is determined weekly.)

₵ = Cedi

Operating the TEK-Block Press

The connection of the mould cover to the lever arm and the automatic locking device serve to reduce the number of manual operations to an absolute minimum.

Pulling back the lever arm moves the piston into the filling position and opens the mould in one operation. When the mould is filled, the lever arm is swung over the mould and down to about the horizontal position on the other side, closing the mould and compressing the block in the process.

The same operation in the reverse direction opens the mould and ejects the block. The simplicity of these operations makes the machine especially suited for unskilled labour, although some care is needed to ensure proper filling of the mould.

PRODUCT INFORMATION: Soil Block Presses

Manual Block Presses Produced in Africa **2**

VS Cinva Ram

Manufacturer
Sohanpal Metal Works Ltd.
P.O. Box 904
Tanga
Tanzania
Tel. 411 58, 28 93

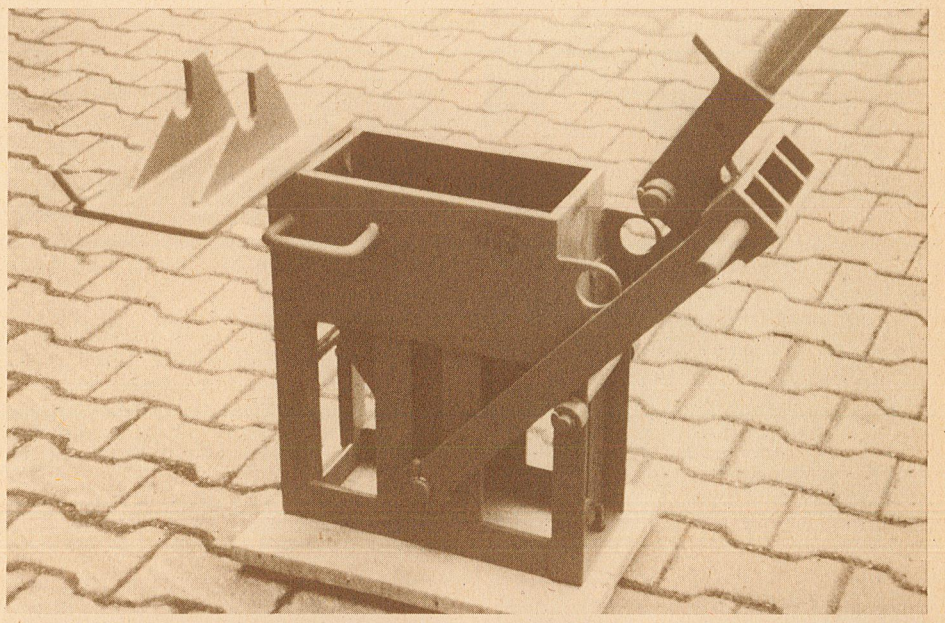
Description

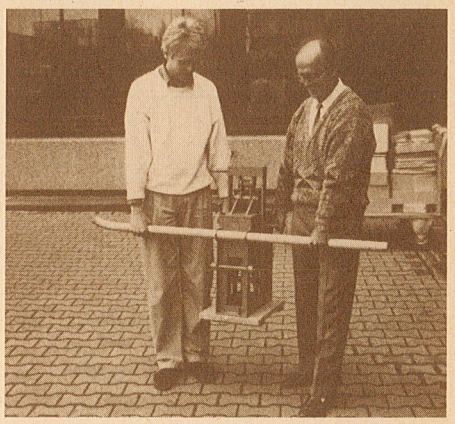
The VS Cinva Ram, which was developed by Thomas Kuby, GATE, is a modified version of the famous Latin American machine, it was named after. The modifications were developed on the basis of observations of local working conditions in Tanzania and problems encountered with other blockmaking machines. The main design objectives of the VS Cinva Ram were high resistance to rough use, prevention of overloading and simplification of manual operations.

The all-steel block press is designed to incorporate components that can be made in local workshops equipped with flame cutter, arc welder, metal saw, drill and lathe. Repairs can thus be carried out in any local metal workshop.

Some interesting details are, for instance, the absence of a latch to hold together the lever arm and yoke, which instead has a handle on one side to pull the yoke and lever arm onto the mould cover. A short handle on the mould cover makes it easy to swing it back for filling. A welded-on stop, however, prevents it from being turned too far back, in which position distortion and breakage are inevitable.

The lever arm is a length of pipe with one end curved, to avoid inserting the wrong end into the socket and minimize the risk of injuries associated with straight projecting parts with sharp corners. Transportation is greatly facilitated by pushing the lever arm through two projecting rings at the side of the press. The machine is carried between two workers, each holding one end of the lever with one hand, and a handle at the side of the mould box with the other.





Operating the VS Cinva Ram

The manual operations of this machine are the same as those of the original CINVA-Ram, except that the lever arm and yoke need not be held together with a latch.

Apart from frequent oiling of the mould, regular lubrication of all moving parts and daily cleaning, no special maintenance is required.

Technical Details

Size of machine (length x width x height)	45 x 30 x 70 cm (18 x 12 x 28 in)
Weight of machine	71 kg
Size of crate for shipment	60 x 40 x 80 cm (24 x 16 x 32 in)
Weight of packed machine	100 kg
Standard block size (single mould)	30 x 14 x 12 cm (11.8 x 5.5 x 4.7 in)
Maximum nominal compaction force	8 tonnes
Nominal compaction pressure	1.9 N/mm2 (280 p.s.i.)
Compression ratio	1.50 : 1
Energy input/transmission	manual/mechanical
No. of blocks per cycle/output rate	1 / 40 blocks per hour
Labour force required (incl. excavation and mixing)	6 men

Price (ex works) VS Cinva Ram (depending on size of order) ..... 300 - 400 US$
valid June 1988

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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Tel. (06196) 79-0
Tlx. 407 501-0 gtz-d

Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

Multibloc BREPAK Block Press

Manufacturer
Multibloc Limited
Blackswarth Road
Bristol BS5 8AX
England
Tel. (0272) 55 19 51
Tlx. 44 716 mobile g
Fax. (0272) 55 08 62

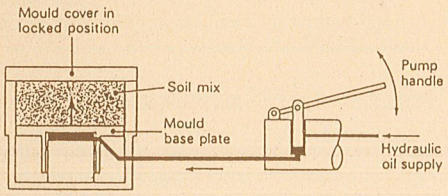
Description

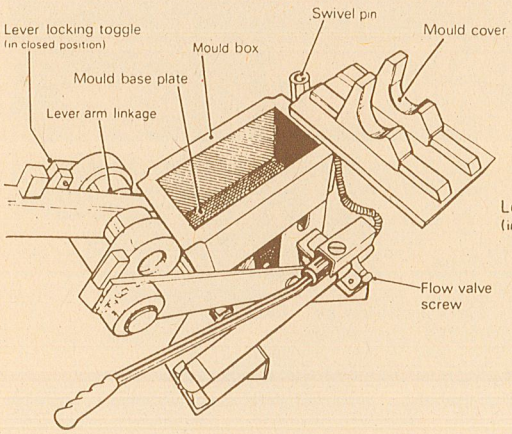
The BREPAK block press was developed in 1980 by D.J.T. Webb at the Building Research Establishment at Watford, England. The aim was to produce stabilized soil blocks of good appearance with a compaction pressure around 10 N/mm², for increased strength and durability, facilitating wall constructions without external rendering, despite low quantities of stabilizer.

Designed on the principles of the CINVA-Ram, the Multibloc BREPAK machine is an all-steel construction, comprising a fixed mould and supporting structural frame. It is fitted with a lever arm extension and mechanical linkage which provides a means of locking the moveable top cover plate onto the mould, and also allows for initial compaction of the soil mix within the mould. The desired compaction pressure - 5 times that of the CINVA-Ram - is achieved by means of a hand operated hydraulic pump, acting through a piston beneath the base plate of the mould.

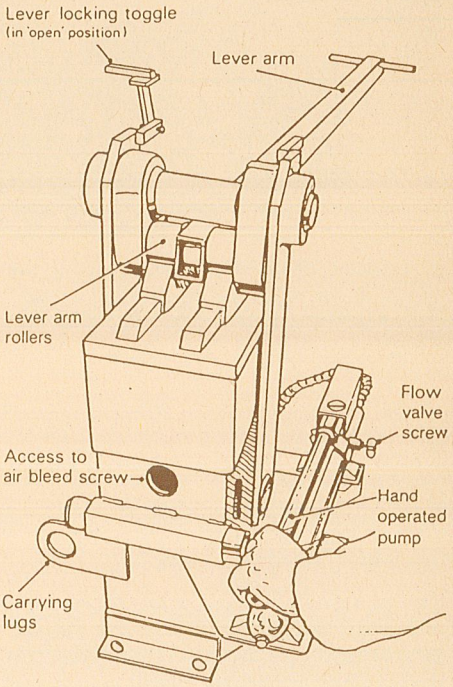
The complete unit is mounted on a firm base, ideally one made of steel sections, or a strong timber baseboard (neither of these are supplied with the machine, because of their weight and high transport costs). For transport from site to site, the press can easily be lifted by four people, using two strong bars held by four projecting brackets, two on either side of the machine.

Action of the hydraulic pump





Details of the BREPAK



Technical Details

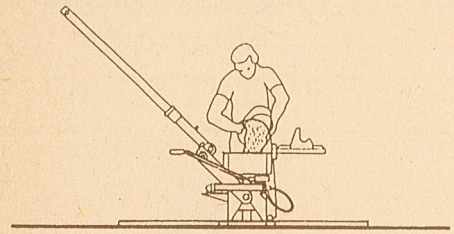
Size of machine (length x width x height)	63 x 44 x 71 cm (25 x 17 x 28 in)
With lever arm extension: total height	229 cm (7 ft 6 in)
Weight of machine (including lever arm)	163 kg
Size of crate for shipment	77 x 57 x 138 cm (30 x 22 x 54 in)
Weight of packed machine	231 kg
Standard block size	29 x 14 x 10 cm (11.4 x 5.5 x 4 in)
Effective thrust on mould base plate	44 tonnes
Effective compaction pressure	10 N/mm² (1450 p.s.i.)
Compression ratio	1.55 : 1
Energy input/transmission	manual/hydraulic
No. of blocks per cycle/output rate	1 / 30 - 40 blocks per hour
Labour force required (incl. excavation and mixing)	6 men

Price (ex works) valid until January 1988			
	BREPAK	1217 £ Sterling	(approx. 2140 US$)
	Seal kit for hydraulic pump	21.56 £ Sterling	(approx. 38 US$)
	Block clamp	20 £ Sterling	(approx. 35 US$)

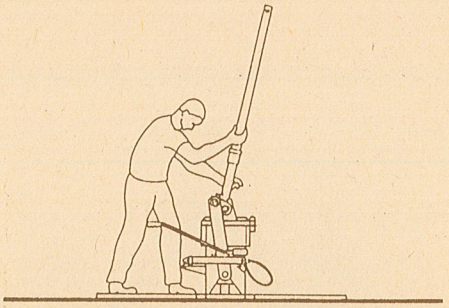
PRODUCT INFORMATION: Soil Block Presses

Operating the BREPAK Machine

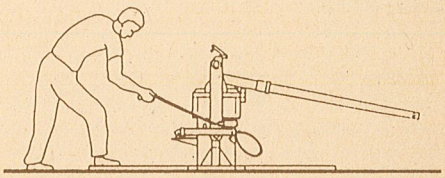
1. With the lever arm in the start position, (at about 45 °), the flow valve screw on the hand pump is opened (one complete turn anticlockwise), the internal faces of the mould box oiled, and the measured amount of soil mix placed in the mould cavity.



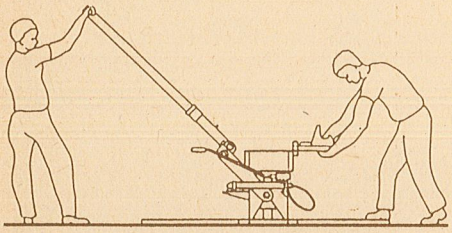
2. The mould cover is swung back to close the top of the mould box, removing the surplus soil, and the lever arm is raised to the vertical position, when the lever locking toggle is released.



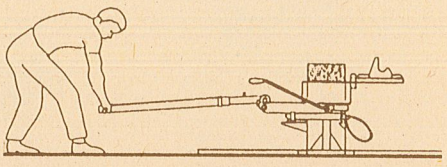
3. The soil is precompacted by continuing the movement of the lever arm down to the horizontal position, the flow valve screw is then turned clockwise until it is hand tight and the hydraulic hand pump operated about 40 full strokes until the pressure relief valve opens with an audible signal, and the handle becomes slack.

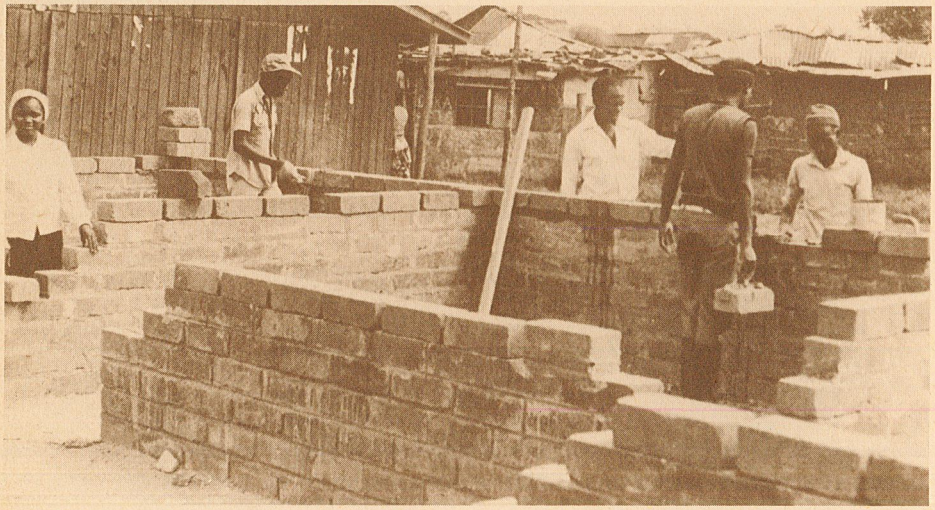


4. With one full turn of the flow valve screw anticlockwise, the lever arm is swung back to its start position, with the lever locking toggle closed again, and the mould cover rotated sideways to expose the pressed soil block.



5. By pulling the lever arm further downwards, and overcoming the resistance by slight jerks, the mould base plate is pushed upwards until the pressed block is completely clear of the mould and can be lifted off and taken away for curing.

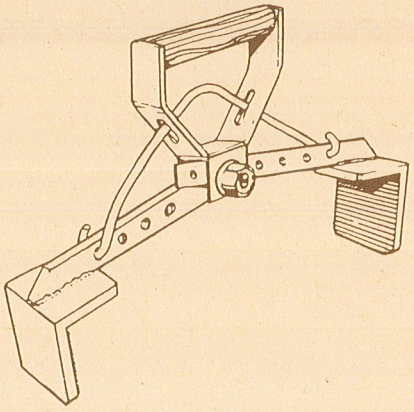




A medical clinic under construction with BREPAK stabilized soil blocks: a joint Anglo-Kenyan research project at Kabiro village, near Nairobi.

The BREPAK Block Clamp Lifter

This device is used to carry the blocks (each weighing about 9 kg) in just one hand, and place them accurately in masonry construction, producing perfectly uniform joints.



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6. Smith, R.G.; Webb, D.J.T.: **Small-scale manufacture of stabilized soil blocks**, International Labour Office, Geneva, 1987
7. Webb, D.J.T.; Lockwood, A.J.: **BREPAK Operators Manual**, Building Research Establishment Client Report,Copy supplied with BREPAK Machine, 1987

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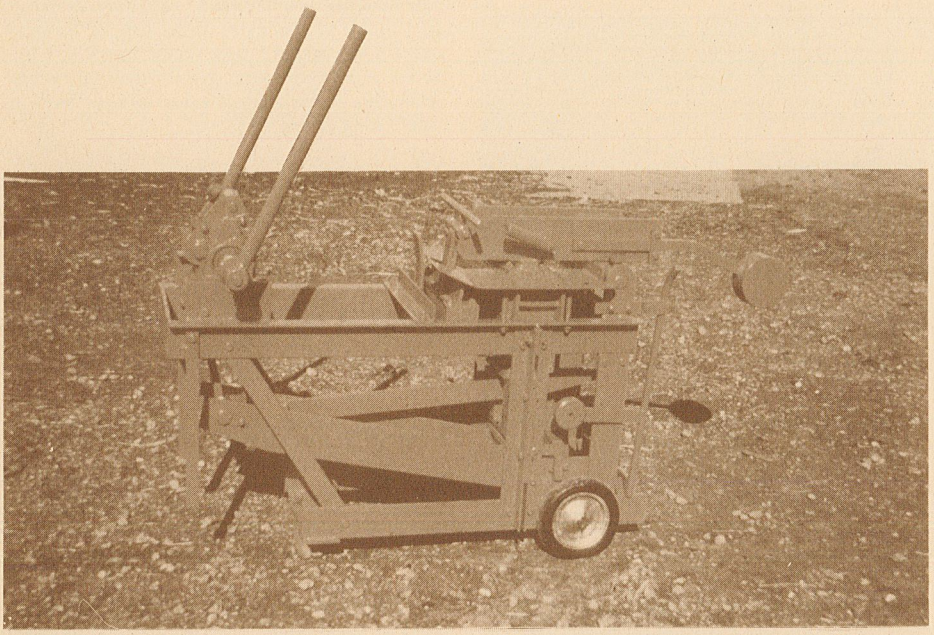
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

TERSTARAM

Hand Operated Press

Manufacturer
APPRO-TECHNO
24 Rue de la Rièze
B-6404 Couvin - Cul-des-Sarts
Belgium
Tel. 60 37 76 71
Tlx. 516 22 ap tec b



Description

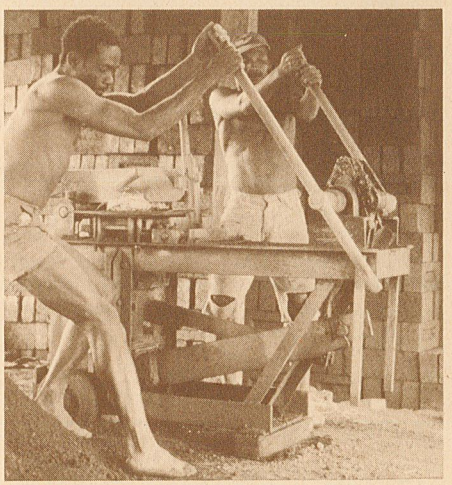
The TERSTARAM press is based on the design of "La Madelon", the famous Belgian machine developed at the beginning of the 20th century, which was later successfully manufactured under the names "Stabibloc" and "Landcrete" in different parts of the world. While the earlier machines were designed to produce compressed bricks for firing, with the possibility of making unfired soil bricks, the TERSTARAM press is sturdier than its predecessors and specifically constructed to manufacture compressed soil blocks, but can also be used to produce clay elements for firing.

The main advantages of the design are the possibility of using various different moulds, which take just 15 minutes to change; the mobility of the machine, which can easily be moved by two men; and the good compaction of the bricks, exerting an exceptionally high pressure for a manually operated press with mechanical energy transmission.

Operating the TERSTARAM

The unclamped lid of the mould is held open by a weight at the rear end, so that the mould can be filled with a shovel. The soil is precompacted by forcefully closing the lid, which is held in place by a clamp. The two lever arms on either side of the machine are simultaneously turned by two men in order to compact the soil.

After completing compaction, the lid is unclamped and opened. By turning the lever arms in the reverse direction, the finished product is pushed upwards and can be removed for drying. A small lever arm beside the mould is pulled sideways to lower the mould base for the next production cycle.



Technical Details

Size of machine (length x width x height)		135 x 70 x 90 cm (53 x 28 x 35 in)
Weight of machine (without mould)		340 kg
Weight of standard sized brick mould		40 kg
Size of crate for shipment		150 x 55 x 102 cm (59 x 22 x 40 in)
Weight of packed machine		550 kg
Standard brick size (double mould), each	a.	22.5 x 10.5 x 6 cm (8.9 x 4.1 x 2.4 in)
Standard block size (single mould)	b.	29.5 x 14 x 9 cm (11.6 x 5.5 x 3.5 in)
Standard block size (single mould)	c.	40 x 20 x 10 cm (15.7 x 7.8 x 3.9 in)
Maximum nominal compaction force		15 tonnes
Nominal compaction pressure		3.6 N/mm² (520 p.s.i.)
Compression ratio (for 60 mm blocks) by just pressing		1.44 : 1
Energy input/transmission		manual/mechanical
No. of bricks per cycle/output rate	a.	2 / 180 bricks per hour
No. of blocks per cycle/output rate	b.	1 / 90 blocks per hour
No. of blocks per cycle/output rate	c.	1 / 70 blocks per hour
Labour force required (incl. excavation and mixing)		5 - 7 men

Price (ex works) valid June 1988	TERSTARAM Standard	45315 FB	(approx. 1240 US$)
	TERSTARAM Special	48900 FB	(approx. 1340 US$)
	Double mould a.	8320 FB	(approx. 230 US$)
	Single mould b.	7510 FB	(approx. 205 US$)
FB = Belgian Francs	Single mould c.	8910 FB	(approx. 245 US$)
	Packing for TERSTARAM Standard	2750 FB	(approx. 75 US$)
	Packing for TERSTARAM Special	3100 FB	(approx. 85 US$)

APPRO-TECHNO Training Program

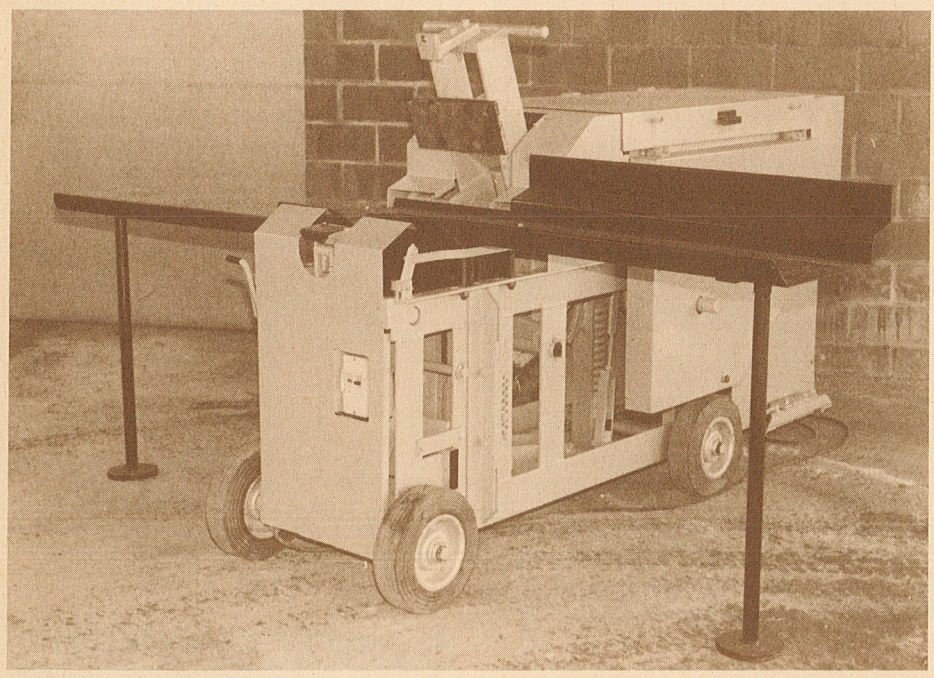
A 4-week training course can be provided for technicians and artisans, either at their home base, or in Belgium (APPRO-TECHNO, Couvin), or in France (CRATerre, Grenoble).

The course covers all aspects of soil block production and can be summarized as follows:
Week 1: Theoretical study of soil characteristics, identification tests, principles of stabilization, design criteria.
Week 2: Selection and excavation of suitable earth, pulverization and mixing, principles of compression, handling and maintenance of presses, quality control.
Week 3: Plant design, organization, management, feasibility studies, visits to block plants.
Week4: Study of design and construction principles for earth structures, principles of surface protection, disaster mitigation and building maintenance.

PRODUCT INFORMATION: Soil Block Presses

SEMI-TERSTAMATIQUE

Motor Operated Press



Additional Equipment

EARTH PULVERIZER, powered by an electric motor (2.2 kW) or by a 5 hp Hatz diesel engine, to produce a homogeneous soil, free from clay lumps and large particles, for better quality bricks and tiles. The earth is pulverized by means of two counterrotating cylinders (squirrel cage), achieving a maximum output of 9 m^3/h.

PLANETARY MIXER, powered by a 5.5 kW electric motor or a 9 hp Hatz diesel, required to obtain a thorough and uniform soil mixture (also suitable for mixing concrete). The mixer is designed for low energy consumption; the rotating paddles are easily removed for cleaning; and transportation is facilitated by two pneumatic wheels. The practical capacity of the mixer is 200 litres.

Technical Details

Size of machine (length x width x height)		220 x 65 x 110 cm (87 x 26 x 16 in)	
Weight of machine (without mould)		840 kg	
Weight of standard sized mould		40 kg	
Size of crate for shipment		227 x 75 x 112 cm (90 x 30 x 18 in)	
Weight of packed machine		1000 kg	
Standard brick size (double mould), each	a.	22.5 x 10.5 x 6 cm (8.9 x 4.1 x 2.4 in)	
Standard block size (single mould)	b.	29.5 x 14 x 9 cm (11.6 x 5.5 x 3.5 in)	
Maximum nominal compaction force		15 tonnes	
Nominal compaction pressure		3.6 N/mm^2 (520 p.s.i.)	
Compression ratio		1.44 : 1	
Energy input/transmission		motorized/mechanical	
No. of bricks per cycle/output rate	a.	2 / 400 bricks per hour	
No. of blocks per cycle/output rate	b.	1 / 200 blocks per hour	
Labour force required (incl. excavation and mixing)		6 - 8 men	
Price (ex works) valid June 1988	SEMI-TERSTAMATIQUE (electric)	347000 FB	(approx. 9500 US$)
	SEMI-TERSTAMATIQUE (diesel)	374000 FB	(approx. 10300 US$)
	Moulds a.	8320 FB	(approx. 230 US$)
	Moulds b.	7510 FB	(approx. 205 US$)
FB = Belgian Francs	Packing	5900 FB	(approx. 165 US$)

Description

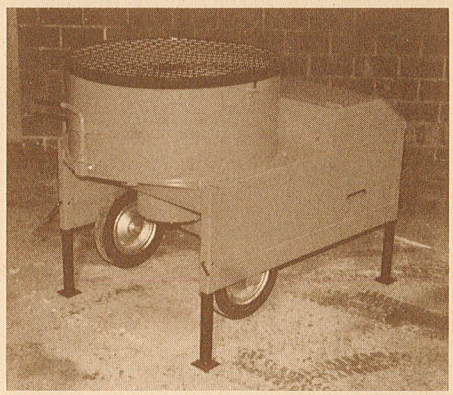
The SEMI-TERSTAMATIQUE machine is a completely revised version of the "La Majo" press, formerly manufactured by "Atelier de Construction de Villers-Perwin". The machine is a motorized press, supplied either with a 2 hp electric motor or 5 hp diesel engine. An oversized Renault car clutch controls and drives the press.

The machine is designed to withstand intensive and rough usage, even under critical climatic conditions, and is easy to maintain with a few tools. A powerful spring in thrust system protects the press against poor quality soils or overfilling of moulds.

Various types of bricks and tiles (for air-drying or for firing) can be produced, as well as salt bricks for livestock. The moulds can be changed within 15 minutes. Special moulds can be made to order up to a maximum size of 40 x 20 x 10 cm. The SEMI-TERSTAMATIQUE is supplied with narrow tables on either side of the mould to facilitate filling the mould and removing the finished products.

Operating the SEMI-TERSTAMATIQUE

The mould is filled with a shovel and the lid closed manually (pre-compaction). The automatic mechanical compression (by a vertical stroke piston) and turning out cycle is set in motion manually. Three workers are normally required to fill the mould, operate the press and remove the blocks for drying. Each production cycle requires 12 to 14 seconds.



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Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

CERAMAN

Manual Press

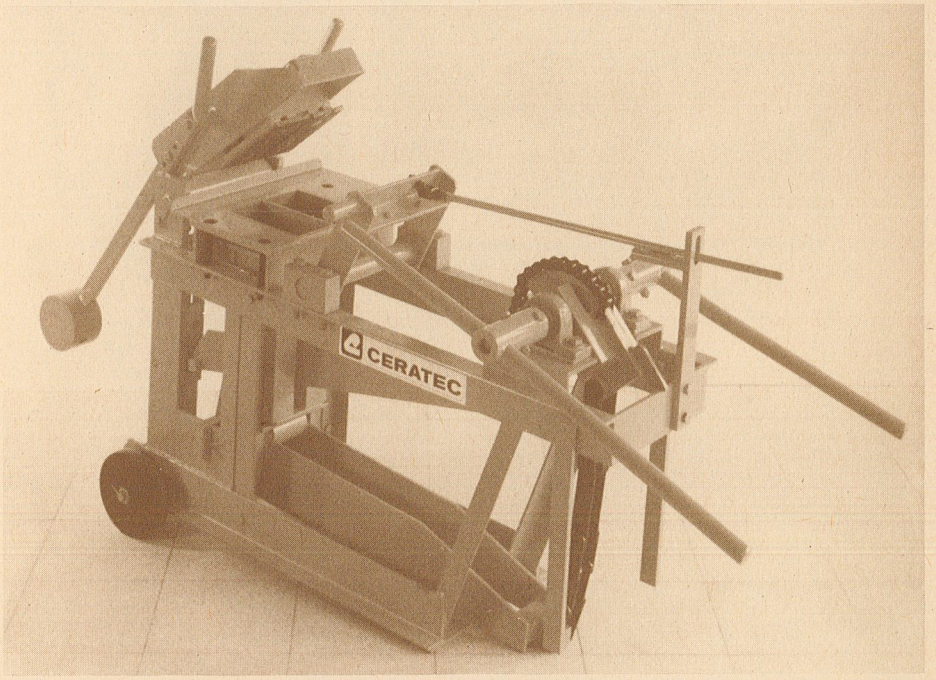
Manufacturer
CERATEC
Rue du Touquet 228
B-7793 Ploegsteert
Belgium
Tel. (056) 58 86 45
Tlx. 57 834 plocer b
Fax. (056) 58 71 01

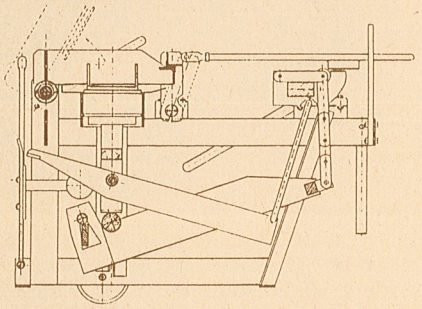
Description

The CERAMAN manual press follows an old Belgian tradition of brickmaking machines. The earliest versions of this machine were developed more than 80 years ago. It has been used in almost every country, on the basis of which it has been continuously improved. The major feature of the CERAMAN manual press is the automatic unlocking of the cover and automatic ejection of the compressed bricks.

The filling of the mould, pressing the two levers for compaction and removal of blocks, all take place at waist level, which is ergonomically extremely efficient and convenient. The main advantage is, however, that a large variety of moulds can be used on the same machine, to produce plain and perforated bricks, paving tiles and even roofing tiles to be fired in a kiln. The moulds can be changed within a few minutes.

The robust all-steel press is fitted with wheels for mobility from site to site. The CERAMAN is available as Type S, producing bricks up to 7 cm high, Type H for 9 cm blocks and Type X for 10 cm blocks.





Operating the CERAMAN

With shovels, the soil mix is piled onto the open mould. The cover is then pushed down forcefully, displacing the excessive soil and precompacting the contents of the mould. The cover is held down with a clamp and compaction of the bricks is effected by turning and pressing down two lever arms. This is done by two men standing on either side of the machine.

When releasing the pressure by turning the lever arms in the reverse direction, the clamp opens and the bricks are automatically ejected. These are immediately removed by hand and placed in the drying area.

Technical Details

Size of machine (length x width x height)		140 x 50 x 100 cm (55 x 20 x 40 in)
Weight of machine (without mould)		370 kg
Weight of standard sized double brick mould		25 kg
Size of crate for shipment		149 x 66 x 116 cm (59 x 26 x 46 in)
Weight of packed machine		610 kg
Standard brick size (double mould), each	a.	22 x 10.7 x 7 cm (8.7 x 4 x 2.8 in)
Standard block size (single mould)	b.	29.5 x 14 x 8.8 cm (11.6 x 5.5 x 3.5 in)
Standard block size (single mould)	c.	40 x 20 x 10 cm (15.7 x 7.8 x 3.9 in)
Maximum nominal compaction force		10 tonnes
Nominal compaction pressure		2.1 N/mm² (305 p.s.i.)
Compression ratio (for 70 mm block) by just pressing		1.50 : 1
Comp. ratio (including dynamic compaction by closing the cover)		± 2 : 1
Energy input/transmission		manual/mechanical
No. of bricks per cycle/output rate	a.	2 / 300 bricks per hour
No. of blocks per cycle/output rate	b.	1 / 150 blocks per hour
No. of blocks per cycle/output rate	c.	1 / 100 blocks per hour
Labour force required (incl. excavation and mixing)		5 men

Price (ex works) December 1987		
CERAMAN Type S	a.	1900 US$
CERAMAN Type H	b.	2030 US$
CERAMAN Type X	c.	2070 US$
Moulds (plain bricks, paving tiles)		270 US$
(perforated bricks)		650 US$
(roofing tiles)		380 - 670 US$
Spare parts package		250 US$

The CERATEC Philosophy: Transfer of Know-how

The CERATEC philosophy and principles are not only to supply machinery, but to provide a complete and reliable solution to its customers together with a real transfer of technology. This transfer of technology includes,amongst others, the choice and analysis of soil, feasibility studies, technological training program in Belgium, on-site start-up and technical follow-up for the first two years. CERATEC carries out expertise missions for existing or future brickworks and organizes local training seminars on industrial brickmaking, tilemaking and stabilized earth blocks. CERATEC can also provide constructive plans of a large variety of kilns.

In the 5 weeks technological training in Belgium the trainees learn:

- how to carry out soil analysis;
- production of compressed blocks as well as fired clay bricks and tiles;
- operation maintenance and repair of production equipment;
- construction and operation of kilns;
- management of brickworks and production units for compressed soil blocks;
- masonry skills and use of other building materials.

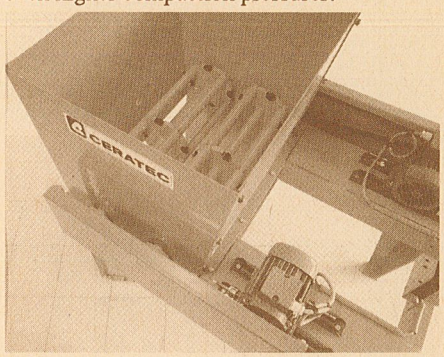
PRODUCT INFORMATION: Soil Block Presses

CERAMATIC Automatic Brick Press

Description

The CERAMATIC brick press with a fixed output rate is an all-mechanical automatic machine with a 3-station rotating table, comprising a filling station, a moulding station and a de-moulding station. The entire cycle of pressing, ejecting and turning the table is operated by motor power, through an electrical motor, diesel or petrol engine. The bricks are pressed at high compaction pressures through a mechanical lever system. The production rate can be determined in advance through the choice of a larger or smaller fly-wheel. Fitted on a robust base frame with four wheels, the CERAMATIC can easily be moved from site to site.

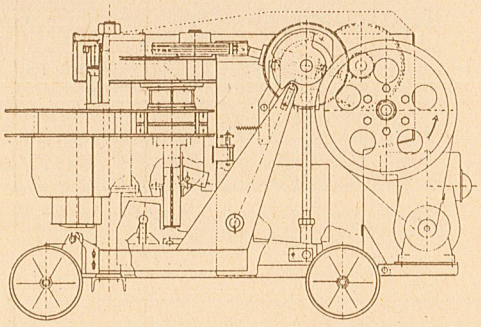
Moulds for special brick sizes are available on request. Alternative to the standard CERAMATIC press, a hydraulic version exists, Type H, which produces bricks of greater heights at even higher compaction pressures.



Operating the CERAMATIC

Once the machine is in operation, the moulds at the filling station are constantly filled by a worker using a shovel. The rotating table turns every 2 to 3 seconds so no pauses are necessary. The over-filled moulds pass under a cone-shaped roller, which removes the excessive soil and pre-compacts the contents of the moulds.

When the compressed bricks are ejected at the de-moulding station, a worker immediately removes the bricks and places them on a wheel-barrow, which is then taken to the drying area.



Additional Equipment

CERADES H2 soil disintegrator, comprising 2 counterrotating hollow drums driven by an electrical or diesel motor, specially developed for use with the manual and automatic presses.

Technical Details

Size of machine (length x width x height)		200 x 100 x 140 cm (80 x 40 x 55 in)
Weight of machine (with motor / without motor)		2040 /1950 kg
Size of crate for shipment		226 x 114 x 166 cm (89 x 45 x 65 in)
Weight of packed machine		2400 kg
Standard brick size (double mould), each	a.	22 x 10.7 x 7 cm (8.7 x 4 x 2.8 in)
Standard block size (single mould)	b.	29.5 x 14 x 7 cm (11.6 x 5.5 x 2.8 in)
Maximum nominal compaction force		30 tonnes
Nominal compaction pressure		6.3 N/mm² (910 p.s.i.)
Compression ratio (for 70 mm brick) by pressing		1.86 : 1
Comp. ratio (including precompaction by conical roller)		± 2 : 1
Energy input/transmission		motorized/mechanical
- Type ME:		4 h.p. electrical motor (1500 rev/min, voltage on choice)
- Type MD:		5 h.p. diesel engine (1500 rev/min, av. consumption 0.6 l/hour)
No. of bricks per cycle/output rate	a.	2 / 1400 - 2000 bricks per hour
No. of blocks per cycle/output rate	b.	1 / 700 - 1000 blocks per hour
Labour force required (minimum)		
- to operate the machine		2 men
- to excavate and prepare the soil, depending on the level of mechanization		4 - 10 men

Price (ex works) December 1987		
	CERAMATIC Type ME	17100 US$
	CERAMATIC Type MD	18200 US$
	CERAMATIC Type H (hydraulic)	on request
	Spare parts package	1770 US$

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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Tel. (06196) 79-0
Tlx. 407 501-0 gtz-d

Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

PACT 500

Mechanical Press

Manufacturer
ALTECH - Société Alpine
de Technologies Nouvelles
Rue des Cordeliers
F-05200 Embrun
France
Tel. 92 43 21 90
Tlx. 420 219

Description

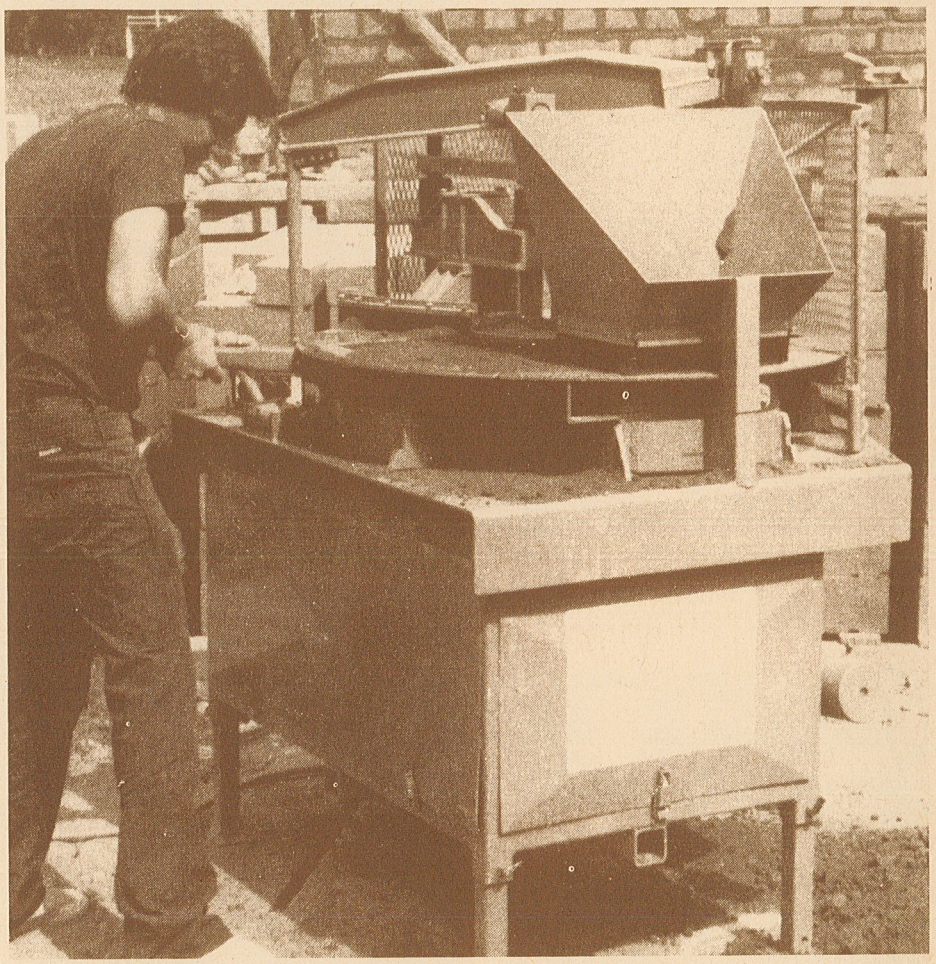
The PACT 500 is a further development of the PACT 315, which was first produced in 1983, and conceived for high-output site production of superior quality compressed soil blocks.

The machine is a motorized press, powered by a 2 hp electric motor. It has a fixed hopper and a 4-station rotating plate, which is either turned manually or motor driven. A chassis with removable wheels and pole for low speed hauling, as well as pneumatic brickyard wheels instead of two feet are delivered with each machine.

The blocks are compressed by a vertical stroke piston which is operated mechanically by a cam, achieving a maximum pressure of 8 N/mm². Each stroke is monitored by springs for compensation and an electronic torque limitator. Special consideration has also been given to safety precautions, the most clearly visible one being the protective screen around the moving parts around the top of the rotating plate.

A variety of moulds is available for different block sizes. For each new block size, the four moulds, the two pistons (compacting and ejecting), the reception pallet (for removal of blocks) and the porch height wedges have to be changed. The whole operation takes about 40 minutes.

The type of electric motor, either 220 V (mono) or 380 V (three phase) is optional.



Technical Details

Size of machine (length x width x height)		130 x 100 x 130 cm (51 x 40 x 51 in)
Weight of machine		600 kg
Size of crate for shipment		120 x 110 x 140 cm (48 x 44 x 55 in)
Weight of packed machine		750 kg
Standard block size (single mould)	a.	29.5 x 20 x 10 cm (11.6 x 7.8 x 3.9 in)
Standard block size (single mould)	b.	29.5 x 14 x 9 cm (11.6 x 5.5 x 3.5 in)
Standard brick size (double mould), each	c.	23 x 11 x 7 cm (9 x 4.3 x 2.7 in)
Maximum nominal compaction force (depending on filling)		30 - 40 tonnes
Nominal compaction pressure (depending on mould size)		4 - 8 N/mm² (580 - 1160 p.s.i.)
Compression ratio		1.8 ; 1
Energy input/transmission		motorized / mechanical
No. of blocks per cycle/output rate	a.	1 / 250 blocks per hour
No. of blocks per cycle/output rate	b.	1 / 250 blocks per hour
No. of bricks per cycle/output rate	c.	2 / 500 bricks per hour
Labour force required (incl. excavation and mixing)		6 - 8 men

Price (ex works) valid June 1988	PACT 500	83000 FF	(approx. 14300 US$)
	Additional set of moulds	2600 to 5800 FF	(approx. 450 to 1000 US$)
FF = French Francs	Packing included in the price of the machine		
	Spare parts package	3200 FF	(approx. 550 US$)

ALTECH Training Program

The efficiency of production and the quality of the products depend largely on the know-how and skill of the operators and the organization of the production site.

ALTECH offers practical training courses for all those concerned with stabilized or unstabilized compressed soil block production and utilization. The courses are tailored to the requirements of the trainees, taking into account their level of know-how and skills.

The courses generally cover:

- selection and excavation of appropriate soils;
- preparation of the most suitable soil mix;
- production of compacted blocks with the PACT 500, stacking and curing of blocks;
- site organization;
- principles of design and construction of buildings made with earth blocks.

PRODUCT INFORMATION: Soil Block Presses

Operating the PACT 500

The hopper is filled either manually by means of shovels, or through a continuous supply discharged from the mixer, positioned at a higher level (eg on a trailer or truck), so that the hopper is fed by gravitation.

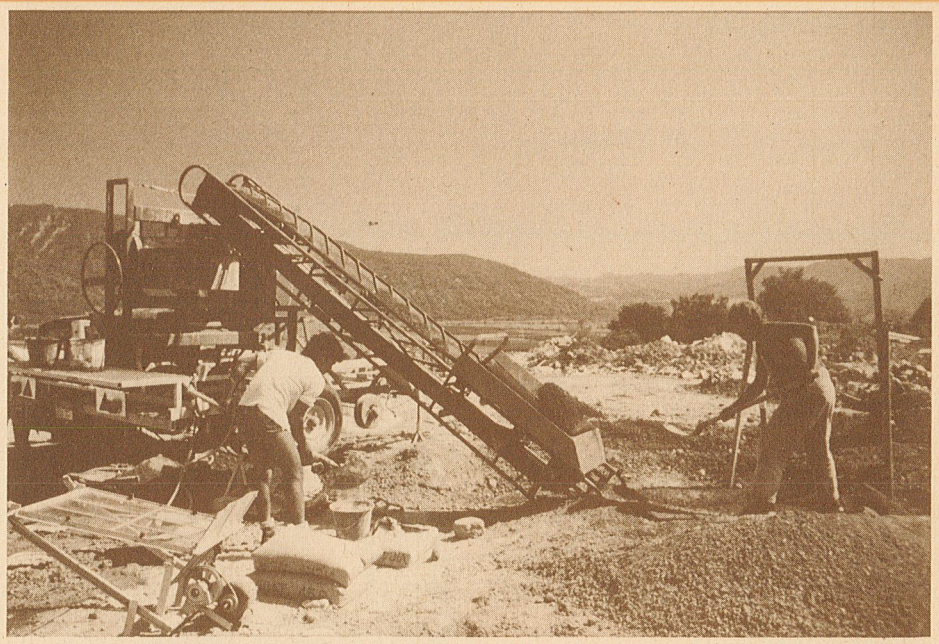
The moulds have only vertical parallel sides and are open at the bottom. The soil rests on the fixed table (under the rotating plate) and slides along it, when the plate moves.

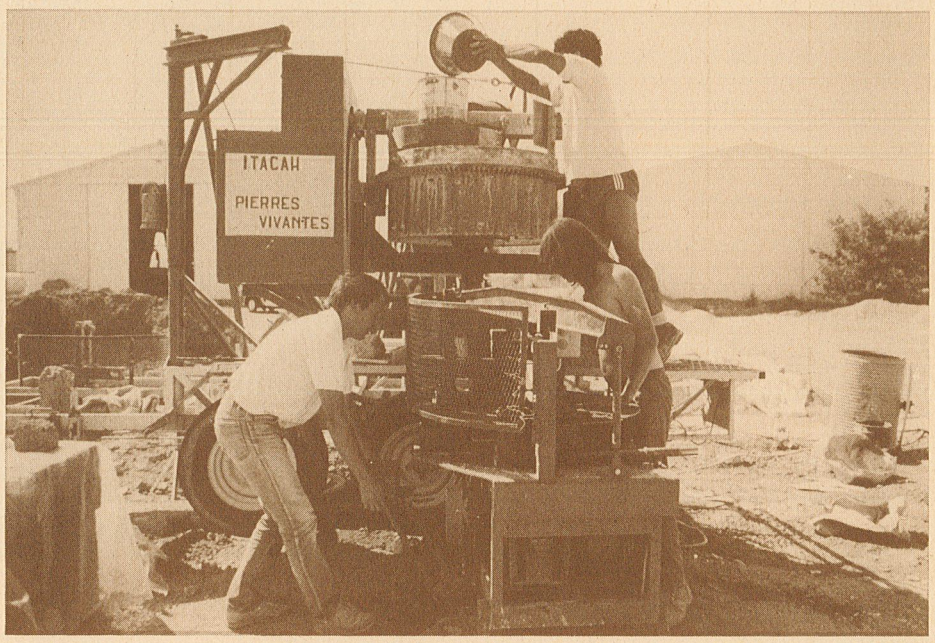
Once the mould under the hopper is filled, it is turned 90° to the next station, thereby levelling the top surface to obtain a uniform volumetric dosage, which is exposed for inspection by the worker in charge of the machine operation controls.

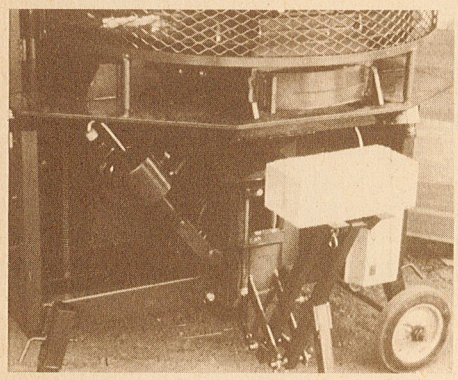
At the next station, the block is compacted by the mechanical press, which takes 5 seconds to complete. This determines the minimum duration of the turning out cycle, which is 6 seconds, achieving a maximum theoretical output of 600 blocks per hour.

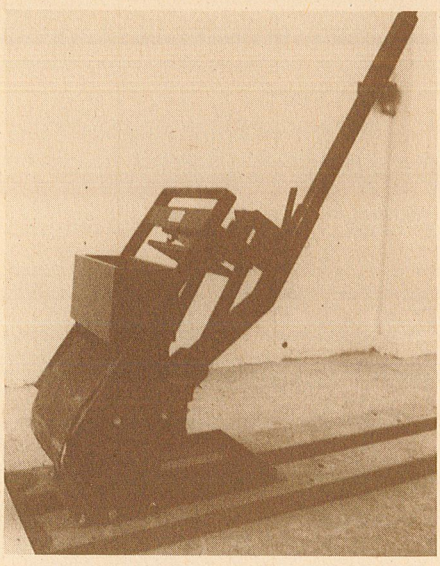
At the last station, the block is pushed by a vertical stroke piston downwards through the open mould base onto a small pallet with a hinged arm. The weight of the block makes the arm tilt out for easy removal of the finished block, after which the pallet moves back to receive the next block.

The only maintenance requirements are weekly greasing of bearings and sliding parts.









Géo 50 Manual Block Press

ALTECH also produces a manual block press, which was developed by Joseph Colzani of ARCHECO, Centre de Terre, Lavalette (near Toulouse), France.

The Géo 50 is a portable block press, designed to produce soil blocks by double compression. Details of the machine are given on a separate Product Information leaflet.

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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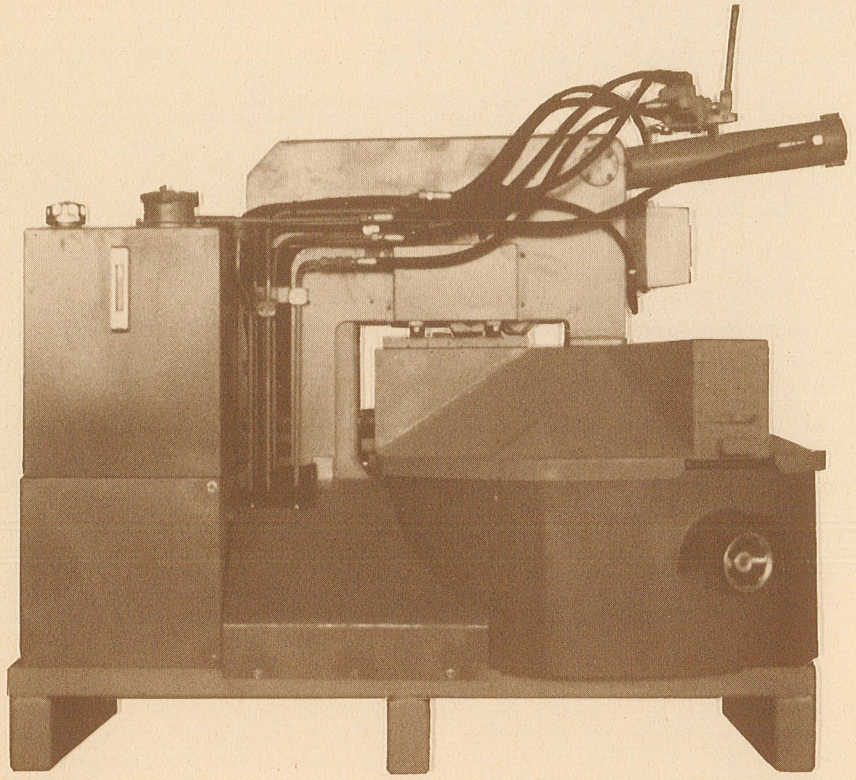
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

DSH

Hydraulic Press

Manufacturer
La Mécanique Régionale
23, rue de la Gare
F-51140 Muizon
France
Tel. 26 02 95 75
Tlx. 306 022 lmr f



La Mécanique Régionale

The manufacturer of the DSH is a French firm which specializes in the production of mechanical and hydraulic equipment, as well as various innovative items that are outside the range of normal specifications.

Along with the supply of equipment, La Mécanique Régionale cooperates with a group of experts to provide a wide range of services:

- Consultancy and expert analysis (including feasibility studies, soil analysis, block manufacture tests, etc.).
- Building design (architectural and engineering services, advice on most appropriate construction technique, detailing, etc.).
- Training courses (in earth construction techniques, manufacture of earth blocks, use, maintenance and repair of equipment, production management, site supervision, and other relevant issues).

The services can be provided in France or in the client's country, and the type and duration of services depend entirely on the client's requirements.

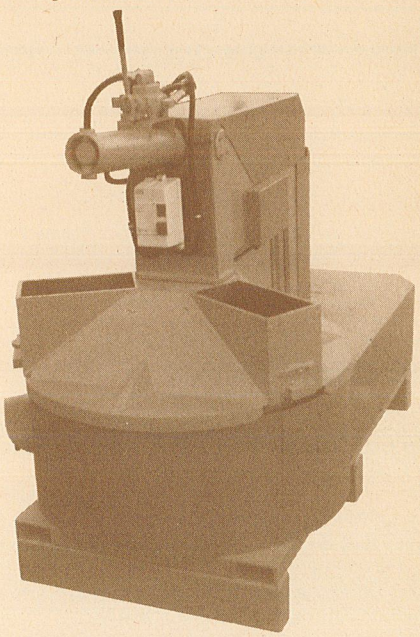
Description

The DSH hydraulic press is a further development of the DSM manual press, designed to improve the production rate and mechanical characteristics of the blocks (by time-saving, simultaneous operations and higher pressure). The DSM and DSH presses were developed by C.T.B.I., a French firm that used to specialize in earth and wood construction.

The principal feature is the rotating table with three moulds, which successively move three times to complete one production cycle (that is, filling of the mould, compression of the soil, and finally, ejection of the block).

The machine is normally supplied with an electric motor, but it is also available with a diesel engine or as a manual press, without any form of motorization (for use in remote areas or places where power or fuel supplies are limited and expensive).

A base frame of hollow steel profiles is provided for easy transportation with a fork-lift, but alternatively the DSH press can be mounted on a self carrying chassis equipped with two wheels, for better mobility on the site or for towing on roads.



Technical Details

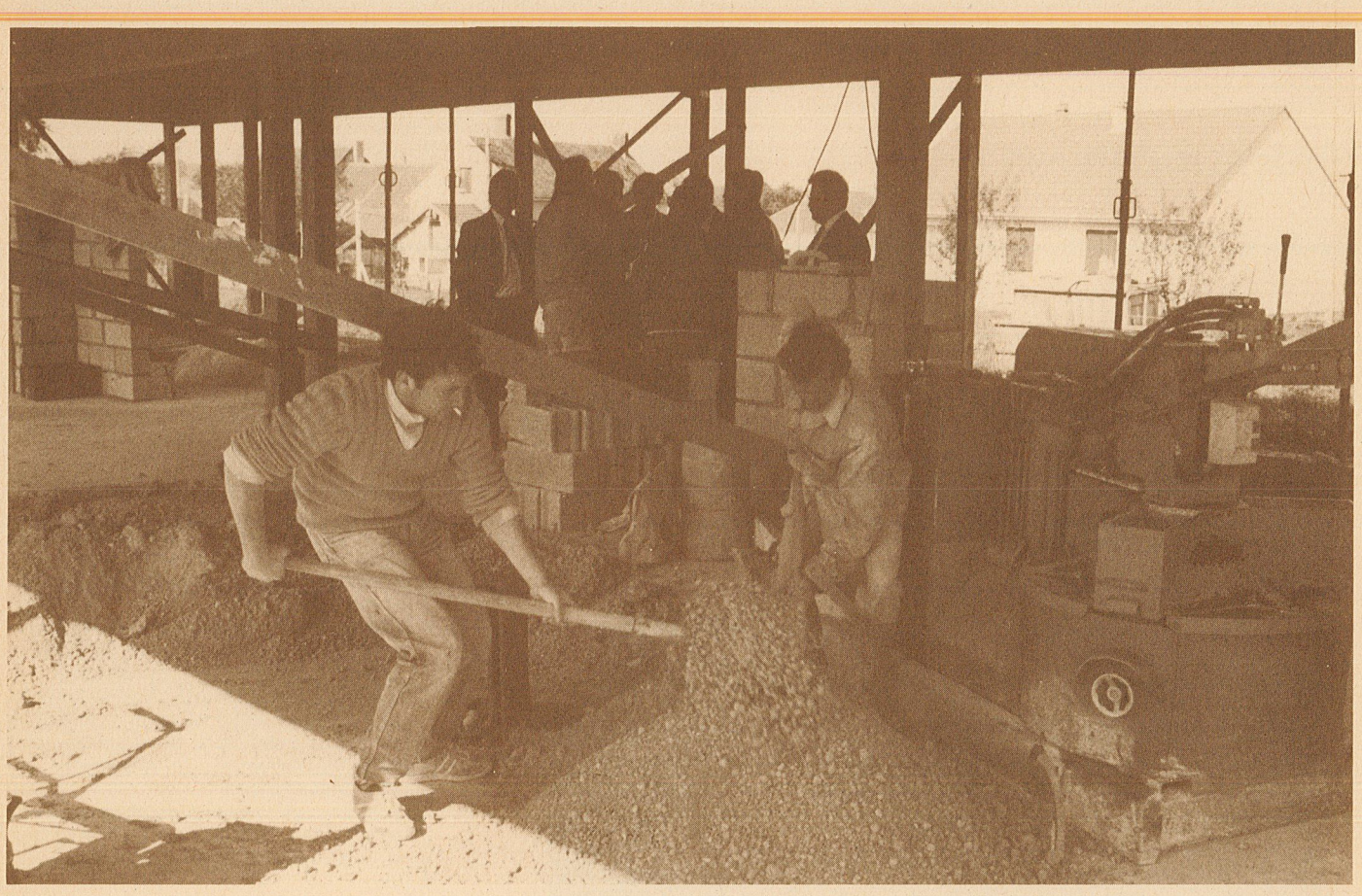
Size of machine (length x width x height)	160 x 90 x 125 cm (63 x 36 x 50 in)
Weight of machine	500 kg
Size of crate for shipment	170 x 100 x 130 cm (67 x 40 x 52 in)
Weight of packed machine	560 kg
Standard block size (single mould)	30 x 15 x 12 cm (11.8 x 5.9 x 4.7 in)
Maximum nominal compaction force	15 tonnes
Nominal compaction pressure	3.3 N/mm² (475 p.s.i.)
Compression ratio (adjustable)	between 1.5 : 1 and 1.64 : 1
Energy input/transmission	motorized/hydraulic
No. of blocks per cycle/output rate	1 / 130 blocks per hour
Labour force required (incl. excavation and mixing)	6 - 8 men

Price (ex works) valid June 1988

DSH (with electric motor)	75000 FF	(approx. 12900 US$)
DSH (with diesel engine)	85000 FF	(approx. 14600 US$)
DSH (manual)	50000 FF	(approx. 8600 US$)
Packing for shipment	3000 FF	(approx. 520 US$)

FF = French Francs

PRODUCT INFORMATION: Soil Block Presses



Operating the DSH

A minimum of two workers is required to ensure an efficient and continuous production of earth blocks with the DSH machine, the main functions being the filling of the moulds, the turning of the rotating table, monitoring and adjusting of the pressure at the end of the compression cycle, and removal of the ejected blocks.

A work force of 3 to 6 people is needed to quarry, transport and prepare the soil mix, which is best heaped close to the press, in order to facilitate the filling of the moulds with a shovel. The ergonomically designed machine, with the mould opening at about waist level, enables the worker to assume the most convenient and least tiring working posture when filling the moulds.

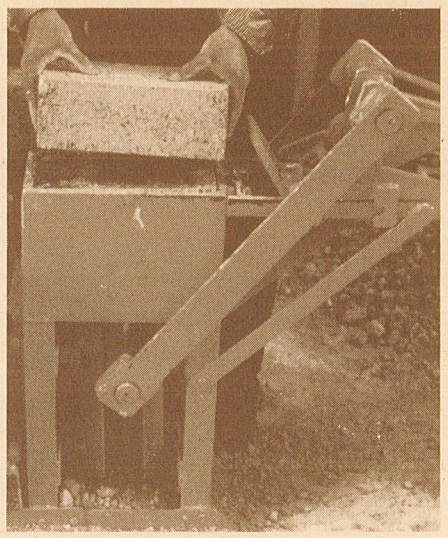
By pulling the lever at the top of the press, the table turns 120°, bringing the filled mould into the compressing position. Compression begins automatically by two vertical stroke hydraulic jacks acting from above and below. The compression pressure is adjustable and compaction is completed in 12 to 13 seconds. Simultaneously, the next empty mould is filled with earth. When both operations are complete, the table is again turned 120° by pulling the lever.

At the third position, the compacted block is automatically ejected for convenient removal and stacking. Again the next empty mould is filled simultaneously, while the second block is being compacted and so on. Each cycle takes about 20 seconds, depending on the efficiency of the workers, so that the theoretical output for motor-driven machines is 180 blocks per hour. Manually operated presses can produce about 130 blocks per hour (theoretical output).

DSM Manual Block Press

La Mécanique Régionale produces the manual press, developed by De Silvestri and patented by C.T.B.I., Muizon, France.

The DSM is a portable block press, based on the CINVA-Ram design, and modified to achieve double compaction and lever action only on one side. Details of the machine are given on a separate Product Information leaflet.



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Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

CLU 3000

Soil Brick Plant

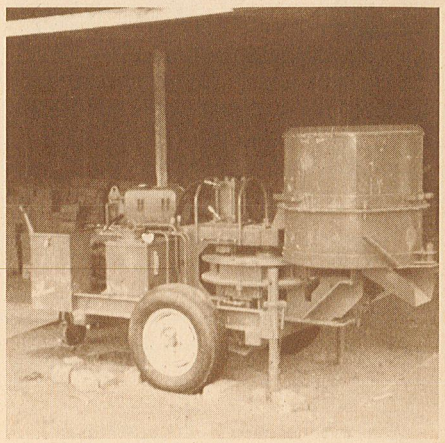
Manufacturer
Intrex GmbH
P.O. Box 1328
D-5608 Radevormwald
Federal Republic of Germany
Tel. (02196) 7069
Tlx. 8513025 intr d

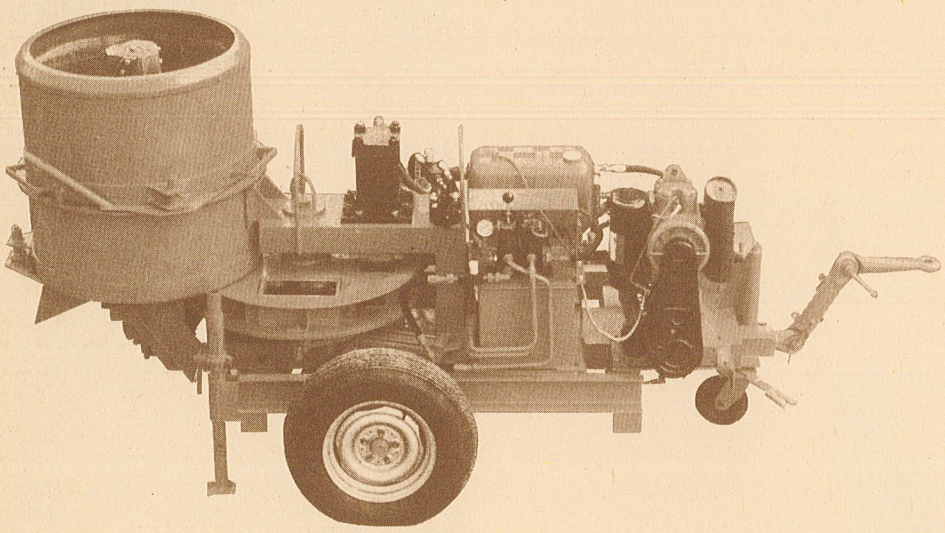
Description

The CLU 3000 was developed in 1980 by the Consolid AG, Switzerland. It succeeded the CLU 2000 (developed in 1977), which was the first self-sufficient, self-powered mobile soil brick plant, fully equipped with a mechanically geared paddle mixer and hydraulically operated, valve controlled press and extruder.

The CLU 3000 incorporates a double mixer unit, the upper mixer used for blending the chemical compounds with the soil, the lower one completing the mixing process and simultaneously feeding the rotating moulds. The 4-station rotating table automatically turns 90° for each step (filling, inspecting, pressing and ejecting). The mixer can also be used independently, if only mortar needs to be mixed.

The whole plant is mounted on a special one-axle trailer with spring-suspended 7.00 x 14 tyres, an adjustable shaft bar, a height adjustable front wheel and hand break. Any suitable vehicle (from a tractor to a bullock cart) can be used to tow the plant to the next production site.





International Cooperation

Numerous building projects in Africa, Asia and Latin America have been carried out with soil bricks made with the CLU 3000 and incorporating the additives of the CONSOLID system.

The machine and the chemical products are being manufactured under licence in Mexico and India, as well as in other countries in the near future.

Details can be obtained from:
CONSOLID AG
CH-9467 Fruemsen
Switzerland
Tel. (085) 75686
Fax. (085) 75795
Tlx. 855122 coag ch

Technical Details

Size of machine (length x width x height)			300 x 145 x 152 cm (118 x 57 x 60 in)
Weight of machine (with motor / without motor)			1600 /1472 kg
Size of crate for shipment			320 x 165 x 188 cm (126 x 65 x 74 in)
Weight of packed machine			2310 kg
Standard brick size (single mould)	a.		25 x 12 x 7.5 cm (9.8 x 4.7 x 2.9 in)
Standard brick size (single mould)	b.		22.8 x 11.4 x 6.3 cm (9 x 4.5 x 2.5 in)
Standard brick size (single mould)	c.		24 x 11.5 x 7.1 cm (9.4 x 4.5 x 2.8 in)
Maximum nominal compaction force			15 tonnes
Nominal compaction pressure			5 N/mm² (715 p.s.i.)
Compression ratio			1.8 : 1
Energy input/transmission			motorized / hydraulic
No. of bricks per cycle/output rate (same for a., b. and c.)			1 / 350 bricks per hour
Labour force required (incl. excavation and mixing)			6 men

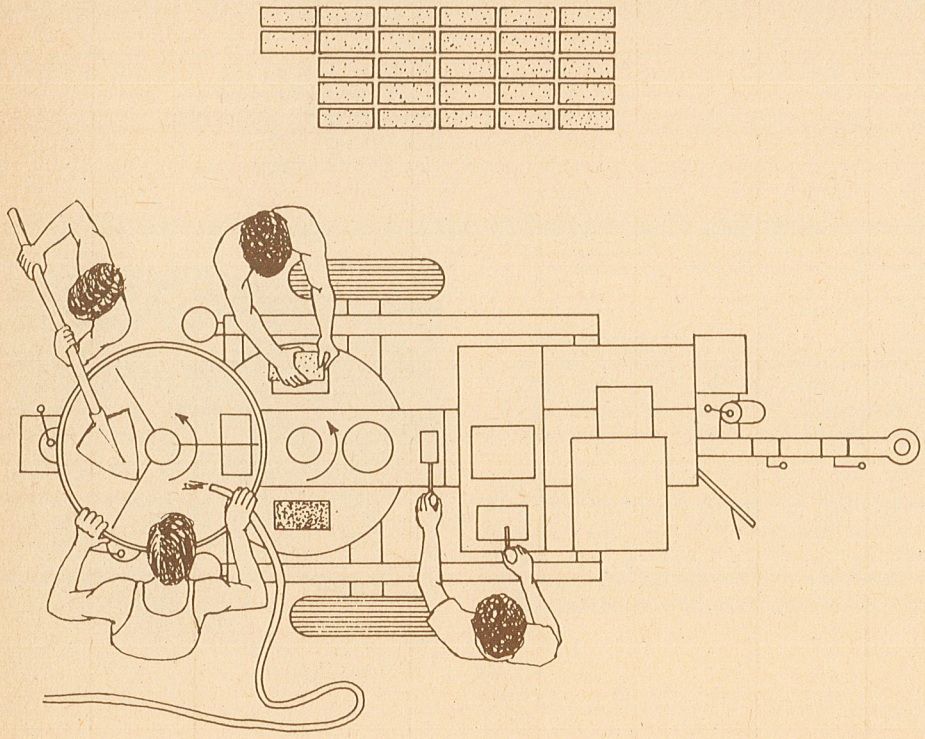
Price (ex works) valid June 1988	CLU 3000	51900.— DM	(approx. 31000.— US$)
	CONSOLID 444 (1 liter)	8.40 DM	(approx. 5.— US$)
	CONSERVEX (1 liter)	2.65 DM	(approx. 1.60 US$)
	SOLIDRY (1 kg)	1.50 DM	(approx. –.90 US$)
DM = Deutsche Mark	Spare parts package	1453.— DM	(approx. 870.— US$)
	Rental cost of CLU 3000 daily	186.90 DM	(approx. 112.— US$)

The CONSOLID System

Three chemical products, designed to control the water sensitivity of soil as a construction material, were developed in the early 1970s by the CONSOLID AG, Switzerland:

CONSOLID 444
a liquid, used in proportions of less than one part per thousand parts of soil, serving to agglomerate the fine particles irreversibly, thus reducing the capillary rise of water and improving the compactability of the soil.
CONSERVEX
a liquid, used in proportions of less than 1 % by weight of the soil, to further reduce the tendency to absorb water, thus improving the effectivity of CONSOLID 444.
SOLIDRY
a dry powder, used instead of CONSERVEX, in the same proportions, in cases when the soil is too moist to permit the satisfactory blending of CONSERVEX. SOLIDRY can also be added to cement and lime to improve their effectiveness.

PRODUCT INFORMATION: Soil Block Presses



Operating the CLU 3000

Two workers are required to fill the mixer with loose soil (100 litres for each batch), additives, such as cement, lime and/or chemical water-proofing compounds (CONSOLID 444 and CONSERVEX), and water. After thorough blending, the mixture is discharged into the lower mixer by means of a sliding valve. Further mixing takes place, and when the rotating table is started, the material is continuously filled into each mould, as it passes under the hole at the bottom of the mixer. In this way, the moulds are always filled with the same quantity of soil mix, ensuring a uniform thickness of the bricks.

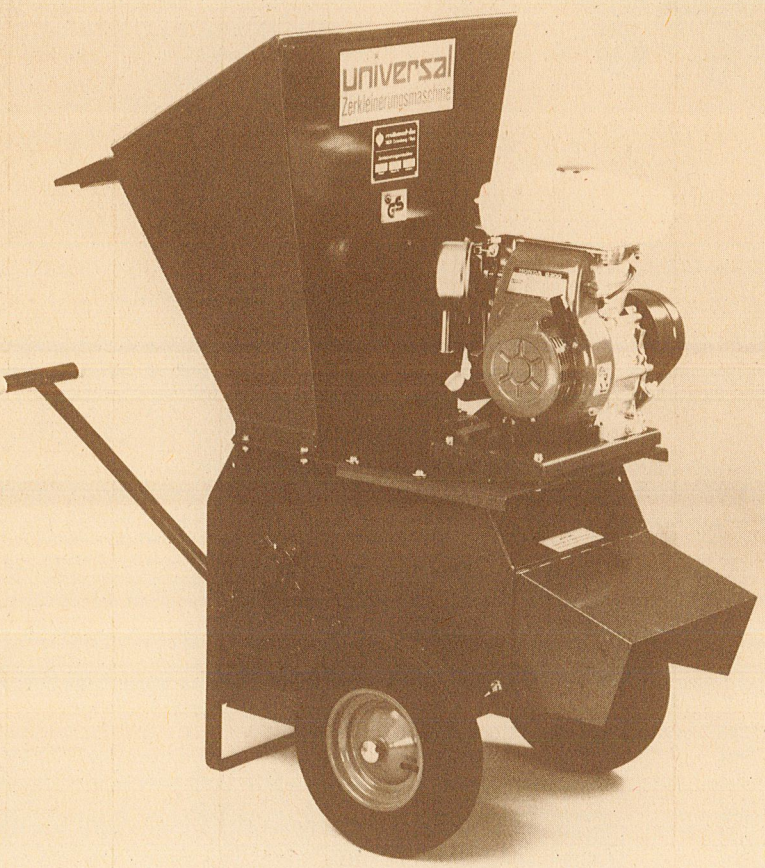
The next turn (90°, anticlockwise) exposes the filled mould for inspection by the third worker, who operates the control switches and thus can respond to any deficiencies immediately. Moving to the next position can be controlled manually or automatically at variable speeds, with intervals between each quarter-turn of about 6 to 10 seconds.

At the third station, each brick is hydraulically compacted by applying 15 tonnes (corresponding to 5 N/mm²). The finished brick is ejected at the fourth station, where a fourth worker removes the brick and places it for drying.

Additional Equipment

CATAPULTER Sieve Machine - Model UNI 400 - which pulverizes soil lumps and removes coarse particles larger than 20 mm, in order to provide the uniform, finely grained soil required for high quality brick production.

The mobile sieve machine (equipped with two semi-pneumatic tyres) is powered either by 7 hp gasoline engine or 5.5 kW electric motor. Weight 220 kg; dimensions 725 x 700 x 1400 mm; output approx. 3 m³ soil per hour.



Special Rental Service

The CLU 3000 Soil Brick Plant with electric motor is also available on a rental basis within Europe. Special discounts are negotiable for rental periods exceeding 30 days.

The machine is available ex works and can be towed by any suitable vehicle or loaded on a truck. The transportation including a transportation insurance can be arranged by Intrex GmbH at cost price, if the customer so wishes.

A detailed manual for the production of compressed soil bricks and for the operation and maintenance of the machine is supplied with the CLU 3000.

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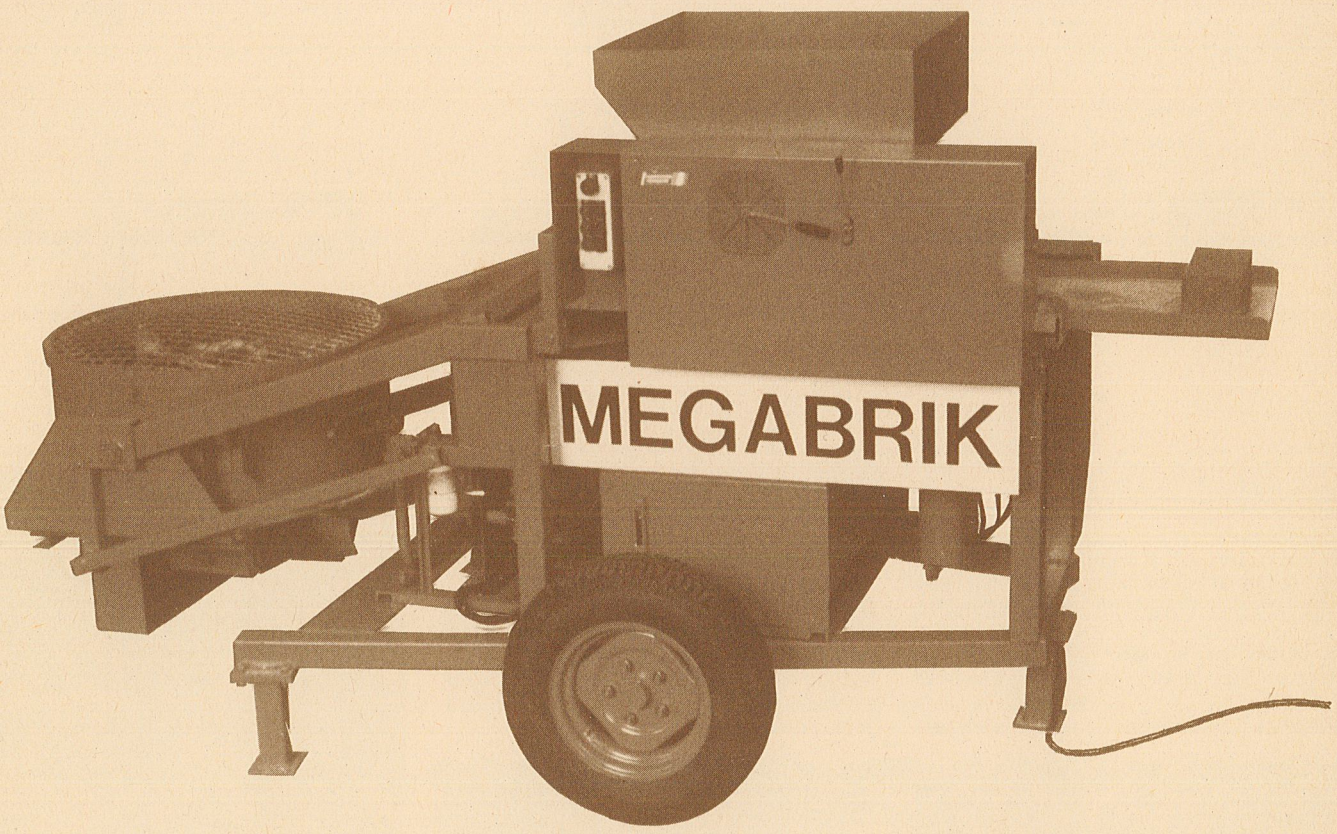
PRODUCT INFORMATION: Soil Block Presses

KIT 15/30

MEGABRIK

Manufacturer
Les Ateliers du Progrès
23 avenue Mont Fleury
F-06300 Nice
France
Tel. 93 89 24 01
Tlx. 970 826 secnce f
Fax. 93 87 47 49



Technical Details

Size of machine (length x width x height)		400 x 200 x 210 cm (158 x 79 x 83 in)
Weight of machine:	Basic Kit (PROHA + COMPAC)	650 kg
	Complete Unit (automatic, diesel) with mixer	1700 kg
Shipment of machine		in crate or container (depending on kit or unit delivered)
Weight of packed machine		ranges from 750 to 1900 kg
Standard block size (single mould)	a.	29 x 14 x 9 cm (11.4 x 5.5 x 3.5 in)
Standard block size (single mould)	b.	24 x 12 x 6 cm (9.4 x 4.7 x 2.4 in)
Nominal compaction force		31.4 tonnes
Nominal compaction pressure		7.7 N/mm² (1100 p.s.i.)
Compression ratio		1.8 : 1
Energy input/transmission		motorized/hydraulic
No. of blocks per cycle/output rate	a. or b. semi-automatic	1/160 blocks per hour
	a. or b. automatic	1/220 blocks per hour
Labour force required (incl. excavation and mixing)		4 - 6 men

Price (ex works) valid June 1988	MEGABRIK		
	Semi-auto., electr., without mixer	99000 FF	(approx. 17000 US$)
	Semi-auto.,diesel, without mixer	106500 FF	(approx. 18300 US$)
	Semi-auto., electr., with mixer	134000 FF	(approx. 23000 US$)
	Semi-auto., diesel, with mixer	154000 FF	(approx. 26500 US$)
	Automatic, electr., with mixer	146000 FF	(approx. 25000 US$)
FF = French Francs	Automatic, diesel, with mixer	166000 FF	(approx. 28500 US$)
	KIT (PROHA + COMPAC + Plans)	56000 FF	(approx. 9600 US$)

Description

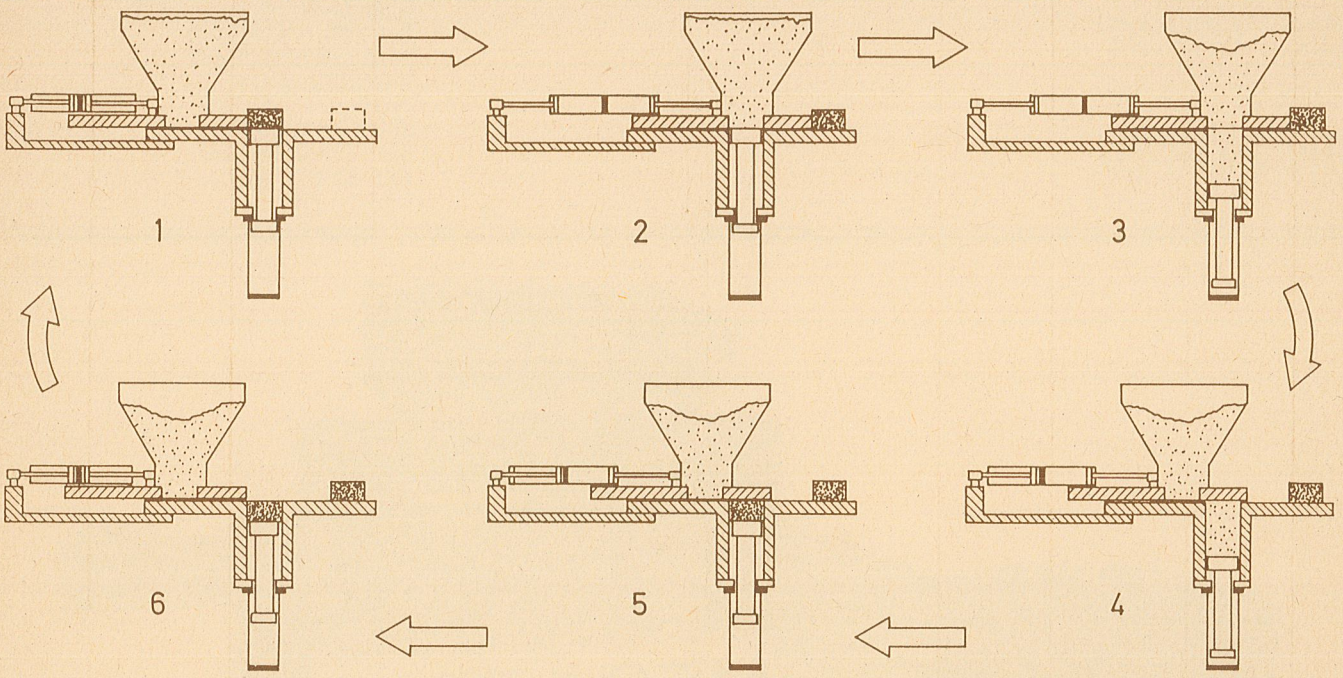
The MEGABRIK, which was designed in 1985, is conceived as a machine consisting of several components that can be assembled in different combinations, according to the requirements of the user. It is, therefore, available as an assembly kit, designed to be put together by a "low-technology" artisan, as well as in a fully assembled, ready-to-use version.

The kit version includes:

- a semi-automatic or automatic hydraulic device, 100 x 80 x 30 cm, called PROHA 15 s (Process Hydraulique Automatique) weighing 85 kg and consisting of a pump, a 100 l hydraulic fluid tank and command panel;
- a compression device, 70 x 70 x 70 cm, called COMPAC 30 tonnes, weighing 320 kg and comprising a mould, moveable hopper with 4 hydraulic jacks and 2 vertical stroke hydraulic jacks for compression;
- and a set of blue prints for assembly.

The ready-to-use version is fixed on a self-carrying chassis with 2 pneumatic wheels, in accordance with road transport standards. The machine is powered either by an electric motor or a 15 hp diesel engine, and can be equipped with a 200 l capacity planetary mixer, which is assembled on two lateral pivoting shafts, which are moved by a hydraulic jack.

PRODUCT INFORMATION: Soil Block Presses



Operating the MEGABRIK

The earth, stabilizer and water are fed manually into the mixer, which blends the contents in 200 s cycles. It is then lifted up automatically by the lateral pivoting shafts to fill the hopper.

The hopper incorporates a vibrating system (exclusive) for constant volume filling of the mould. The top cover of the mould is also attached to the hopper and moves back and forth with each change of the hopper's position, as shown in the diagram.

The filling, compression and turning out is done semi-automatically by means of a 7-position manually operated lever, or automatically by means of a pre-programmed device with a hydraulic by-pass. The theoretical duration of one production cycle is 20 seconds for semi-automatic operation and 15 seconds for automatic production.

Note: The technical details were provided by the producer. GATE is not in a position to verify these data and therefore cannot accept the responsibility for any inaccuracies. As the prices and exchange rates are subject to change, they are only meant to serve as guidelines.

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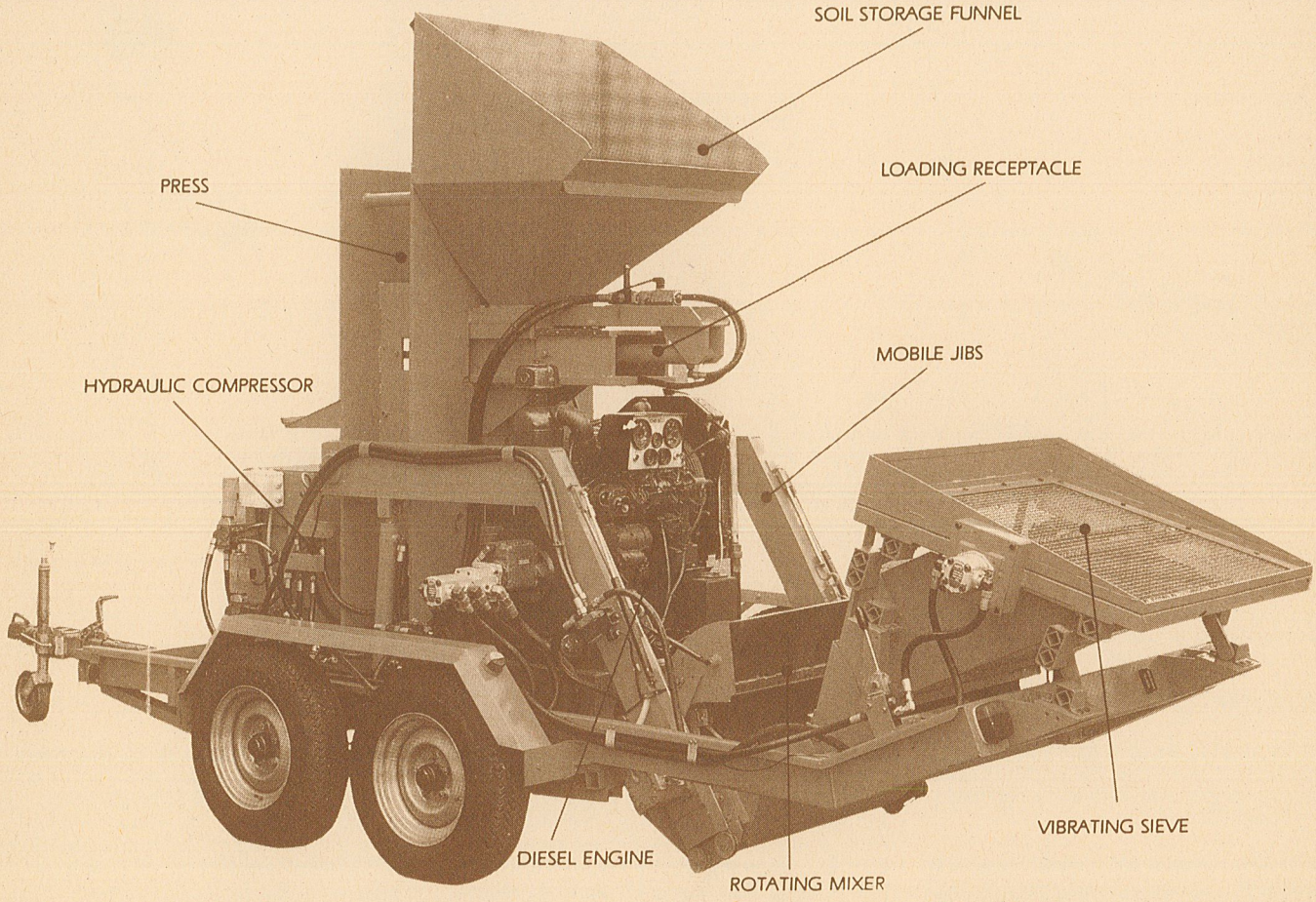
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

PRESS - BLOC 80 TM

Mobile Production Unit

Manufacturer
GEOBETON ONE
B.P. 91
F-53021 Laval CEDEX
France
Tel. 43 49 09 48
Tlx. 722 603 f



Technical Details

Size of machine (length x width x height)	462 x 222 x 295 cm (182 x 88 x 116 in)
Weight of machine (without mould)	3500 kg
Shipment of machine	in standard container (details according to shipping company)
Weight of packed machine	3800 kg
Standard block size (single mould)	29 x 14 x 9 cm (11.4 x 5.5 x 3.5 in)
Maximum nominal compaction force	80 tonnes
Nominal compaction pressure	20 N/mm² (2900 p.s.i.)
Compression ratio	2 : 1
Energy input/transmission	motorized / hydraulic
No. of blocks per cycle/output rate	1 / 320 blocks per hour
Labour force required (incl. excavation and mixing)	6 - 8 men

Price (ex works) valid June 1988	PRESS - BLOC 80 TM	525000 FF (approx. 90200 US$)
	Kit for mould substitution	on request
	Spare parts package	included in the price of the machine

FF = French Francs

Description

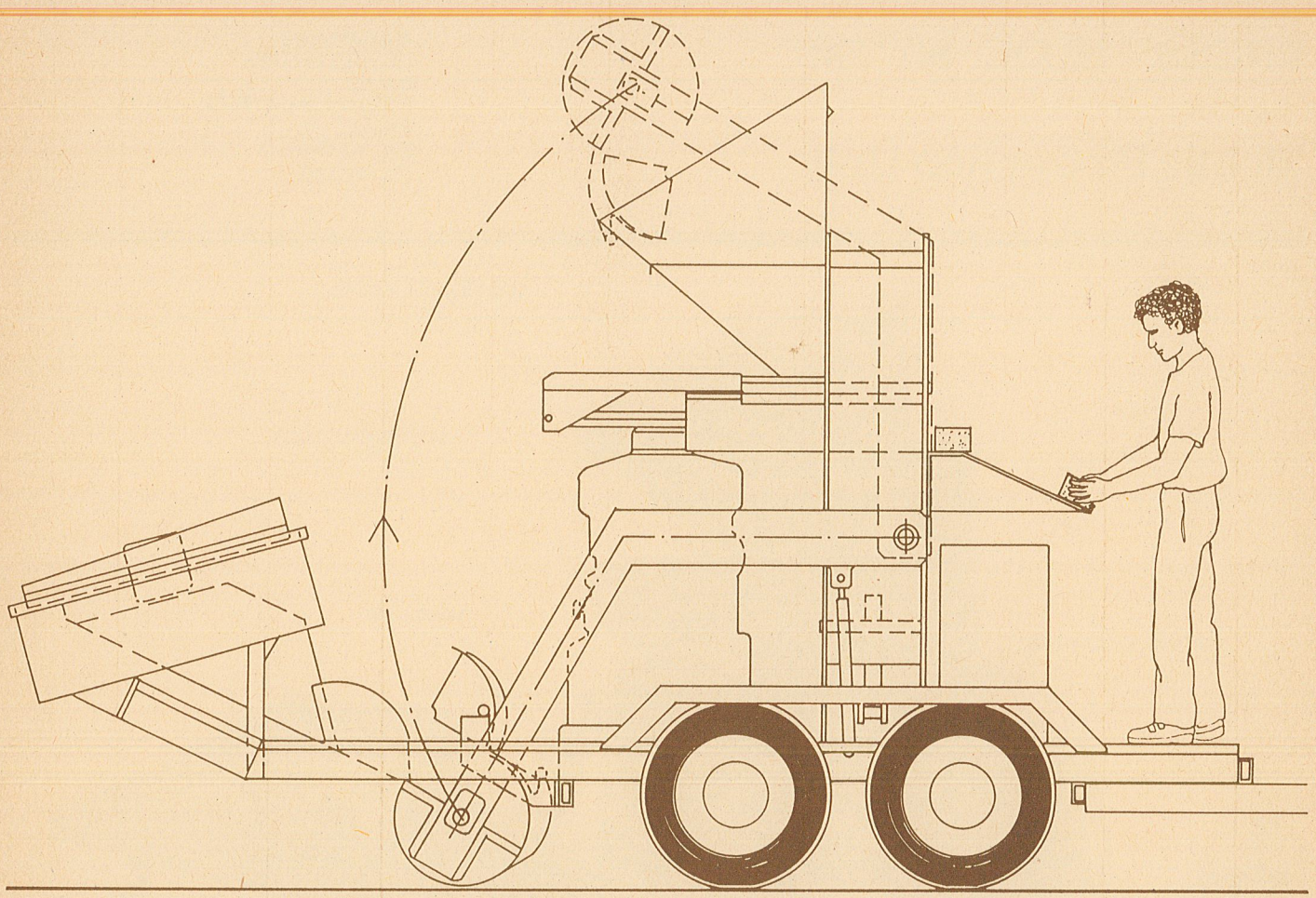
The PRESS - BLOC 80 TM, first constructed in 1984, succeeded the company's first machine, the H 60 press, developed in 1981.

The machine is a mobile production unit, fixed on a self-carrying chassis equipped with 4 wheels, in accordance with road transport standards. The self-contained unit incorporates a vibrating sieve, a horizontal shaft mixer, a hopper and a hydraulic press, all powered by a single 47 hp diesel engine, which has a 30 l tank and diesel consumption of 5 l/h.

The press is designed to produce blocks of 29 x 14 x 9 cm with a tolerance of ± 3 mm for the height (at maximum compression) and a very smooth surface, achieved by hypercompression reaching a working pressure of 20 N/mm². The blocks can be made solid or with recesses (by inserting frogs). Different sized blocks can be made to suit local requirements by changing the mould (within 1 hour). The height of the blocks is adjustable between 5 and 10 cm.

The PRESS - BLOC 80 TM is conceived for use in harsh tropical conditions, and has a large in-built safety factor in all hydraulic jacks, pumps, flexible pipes and mechanical items. Resisting parts are manufactured in special steel and are replaceable.

PRODUCT INFORMATION: Soil Block Presses



Operating the PRESS - BLOC 80 TM

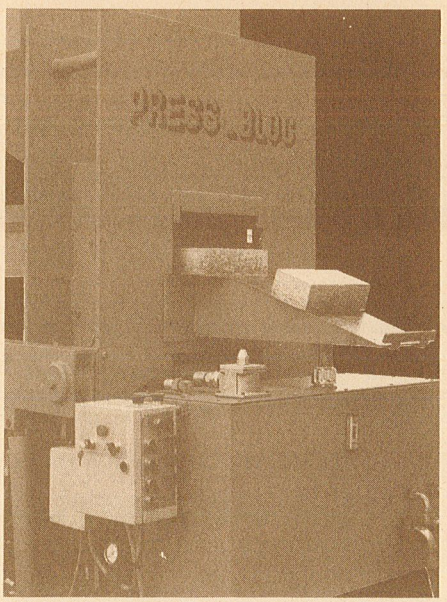
The production of soil blocks comprises both manual and automatic operations and is carried out in two stages, which function independently of each other.

The vibrating screen is fed manually by a crew with shovels or a front-end loading tractor. The screen vibrates automatically, separating stones and foreign debris from the earth, which drops into a hopper and through an automatically controlled funnel loader into the mixer.

The addition of a stabilizer (if required) and water is done manually, directly in the mixer. After thorough blending, the mixer is lifted up automatically by the two lateral pivoting shafts. At the topmost position, the mixer opens automatically, dropping the soil mix into the 200 l fixed hopper. This concludes the first production phase.

The automatic filling, hydraulic compression and turning out cycle is controlled independently of the other operations by an electronic and pre-programmed computerized device, which incorporates a release mechanism. The compression speed of the vertical stroke hydraulic jack is 75 mm/s during precompression and 10.8 mm/s during hypercompression; the compression pressure is adjustable.

A worker, standing on the base frame, removes the blocks as they are ejected from the press, at intervals of approximately 8 seconds.



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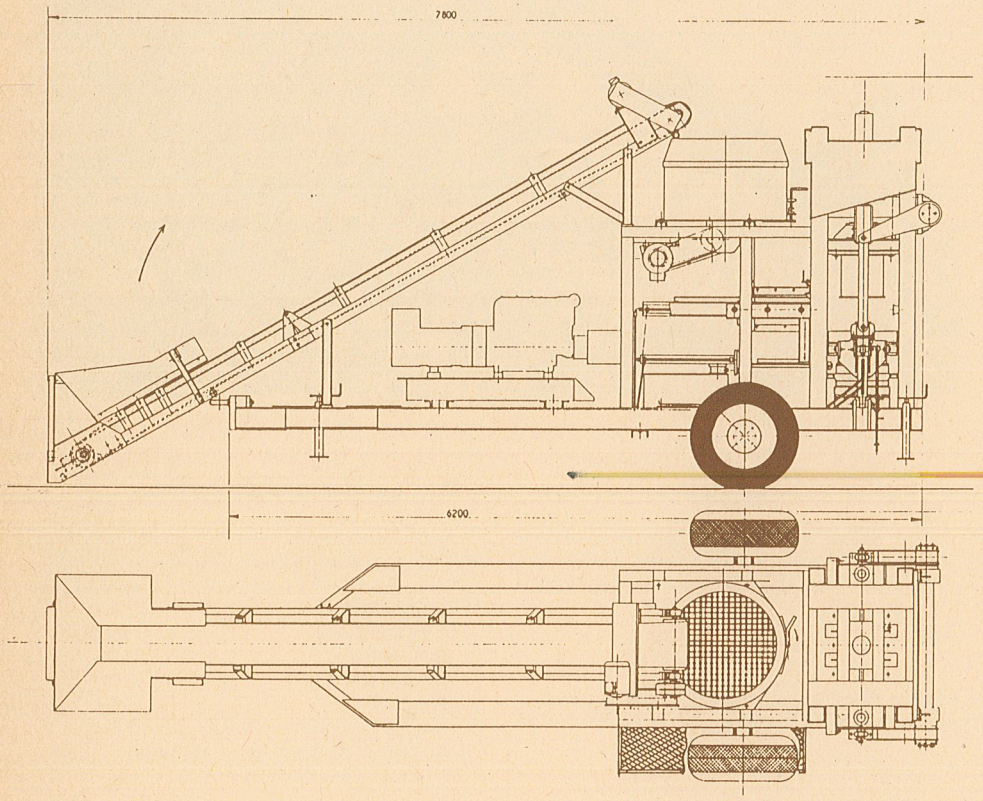
Prepared by K. Mukerji and CRATerre (1988)

PRODUCT INFORMATION: Soil Block Presses

DYNATERRE 01. 4 M

Mobile Production Unit

Manufacturer
Ets RAFFIN
700 route de Grenoble
BP 9 Domène
F-38420 Le Versoud
France
Tel. 76 77 15 27
Tlx. 320 802



Description

The DYNATERRE range of machines is based upon research on the production of earth blocks by static and dynamic compression by vibration. The research was conducted in co-operation with the School of Architecture of Saint Etienne (France), under the guidance of Dr. André Acceta.

The DYNATERRE 01. 4 M is a mobile production unit, fixed on a self-carrying chassis equipped with 2 wheels, which comply with the highway code requirements for heavy vehicles.

The production unit incorporates a conveyor belt, a 365 l planetary mixer, a water tank with a motor-pump and a spraying device, a hopper and a hydraulic press. The unit is powered by a 24 kW electric motor; a 40 hp diesel generator set with a 35 kVA alternator is optional. Energy consumption is 12 kW/h, achieving mechanical and hydraulic working pressures between 3 and 25 N/mm².

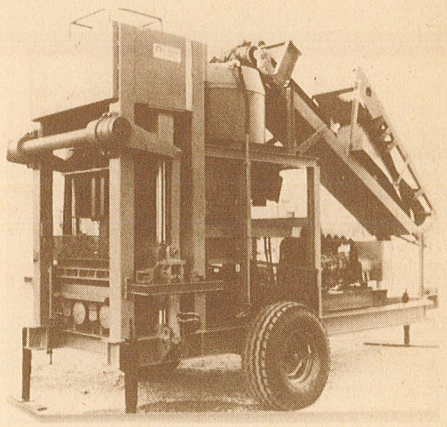
The outstanding feature is that the soil is vibrated during compression (dynamic compression), whereby the soil particles are allowed to settle naturally, filling the cavities and avoiding excessive internal friction or vacuum. As a result, the compaction of the soil is more effective and is achieved with less energy input than would be necessary without vibration. The vibration frequency is 50 Hz, vibration amplitude is 3 mm. The compression is carried out by a vertical stroke hydraulic jack, while the ejection of the blocks is done mechanically.

On account of the dynamic compression system, the DYNATERRE 01. 4 M can also be used to produce concrete blocks, solid or hollow, in all common shapes and sizes. Whether earth or concrete, 4 blocks are produced during each turning out cycle. Each cycle takes 40 seconds, so that the theoretical output is 360 blocks/hour. The practical output is about 250 blocks/hour.

Technical Details

Size of machine (length x width x height)		790 x 240 x 360 cm (311 x 95 x 142 in)
Weight of machine (without mould)		6000 kg
Size of folded up machine for shipment		580 x 240 x 360 cm (228 x 95 x 142 in)
Weight of machine for shipment (no packaging required)		6000 kg
Hollow or solid block size (4 at a time), each	a.	40 x 20 x 20 cm (15.7 x 7.9 x 7.9 in)
Hollow or solid block size (4 at a time)	b.	40 x 15 x 20 cm (15.7 x 5.9 x 7.9 in)
Hollow or solid block size (4 at a time)	c.	40 x 10 x 20 cm (15.7 x 3.9 x 7.9 in)
Maximum nominal compaction force		35 tonnes
Nominal compaction pressure		1 N/mm² (145 p.s.i.)
Compression ratio		2 : 1
Energy input/transmission		motorized / hydraulic and mechanical
No. of blocks per cycle/output rate	a.	4 / 250 blocks per hour
No. of blocks per cycle/output rate	b.	4 / 250 blocks per hour
No. of blocks per cycle/output rate	c.	4 / 250 blocks per hour
Labour force required (incl. excavation and mixing)		8 - 10 men

Price (ex works) valid June 1988	DYNATERRE 01. 4 M	482800 FF	(approx. 83000 US$)
	DYNATERRE 01. 6 M	545000 FF	(approx. 94000 US$)
	DYNATERRE 03	825000 FF	(approx. 142000 US$)
FF = French Francs	DYNATERRE 04	928350 FF	(approx. 160000 US$)
	Moulds	on request (One set is included in the price of the machine.)	
	Spare parts package	included in the price of the machine.	



PRODUCT INFORMATION: Soil Block Presses

Operating the DYNATERRE 01. 4 M

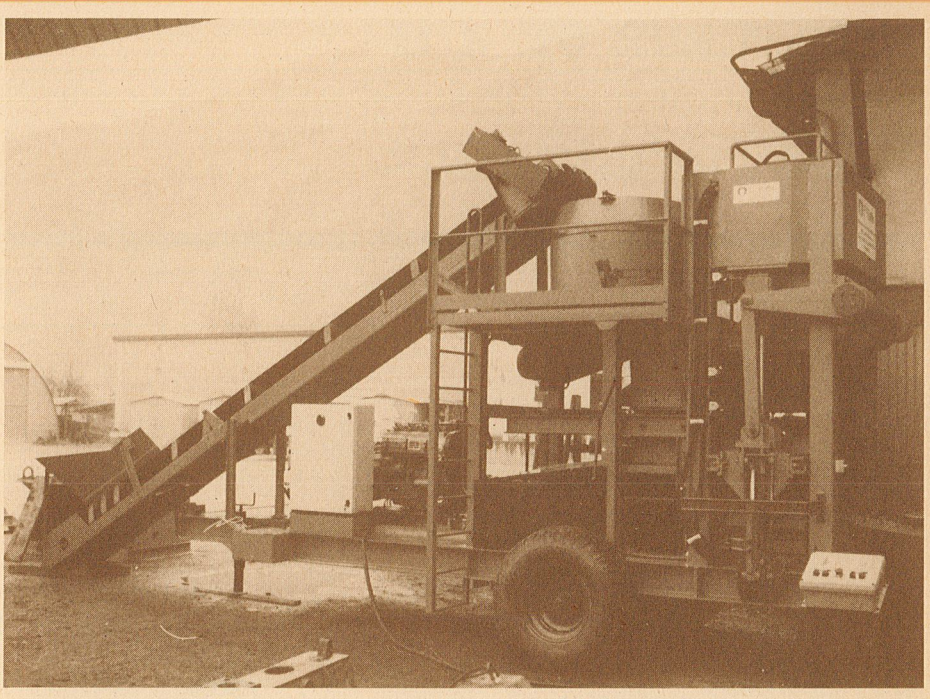
Once the mobile unit has been manouvred to a suitable position, the conveyor belt is folded down and the feet lowered to give the machine a firm support.

The hopper, mounted on the conveyor belt, is fed with earth and appropriate quantities of the stabilizer. The conveyance of these materials to the mixer is activated manually, as also the starting up of the mixer and the opening of the hopper to release the earth and stabilizer.

Water is added directly into the mixer by a motorized pump (equipped with a flow regulator) through a sprinkling bar.

All the following operations (filling of the moulds, vibrating, compressing, turning out and ejecting) are successively set in motion manually with the possibility to repeat certain operations (by backward movement).

Without excavating, transporting and preparing the soil, 5 - 6 workers are required to operate the DYNATERRE 01. 4 M, producing about 4 blocks per minute.

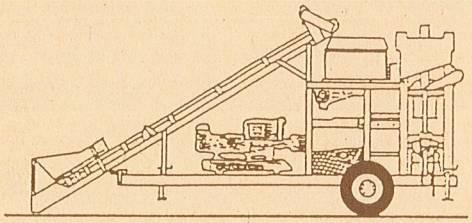


The DYNATERRE Range of Machines

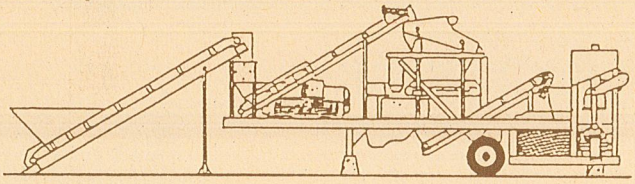
A variety of larger sized production units are available. These are not different types of machines to chose from, but more a question of addition of several components, which serve to incorporate more functions, improve the quality of the products and/or increase the production rate to the extent of an industrial unit.

The following alternatives are possible:

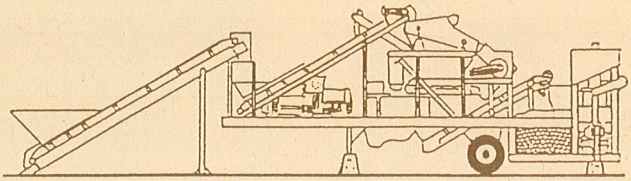
DYNATERRE 01. 6 M, a more powerful version (motor, 500 l mixer) of the 01. 4 M, producing six 40 x 20 x 20 cm blocks per cycle, and theoretical output of 540 blocks/hour.



DYNATERRE 03, same as 01. 6 M, plus a pulverizer, a vibrating sifter and a binder proportioner.



DYNATERRE 04, same as 03, plus a grinder.



Other Machines and Equipment

The following is a selection of other heavy duty machines and equipment, produced by Raffin, for the large-scale quarrying and handling of building materials:

- paddle wheel
- jet crusher
- impact crusher
- rod mill
- mobile screening and grinding unit
- screens, conveyor belts, hoppers
- stone cutting machine

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